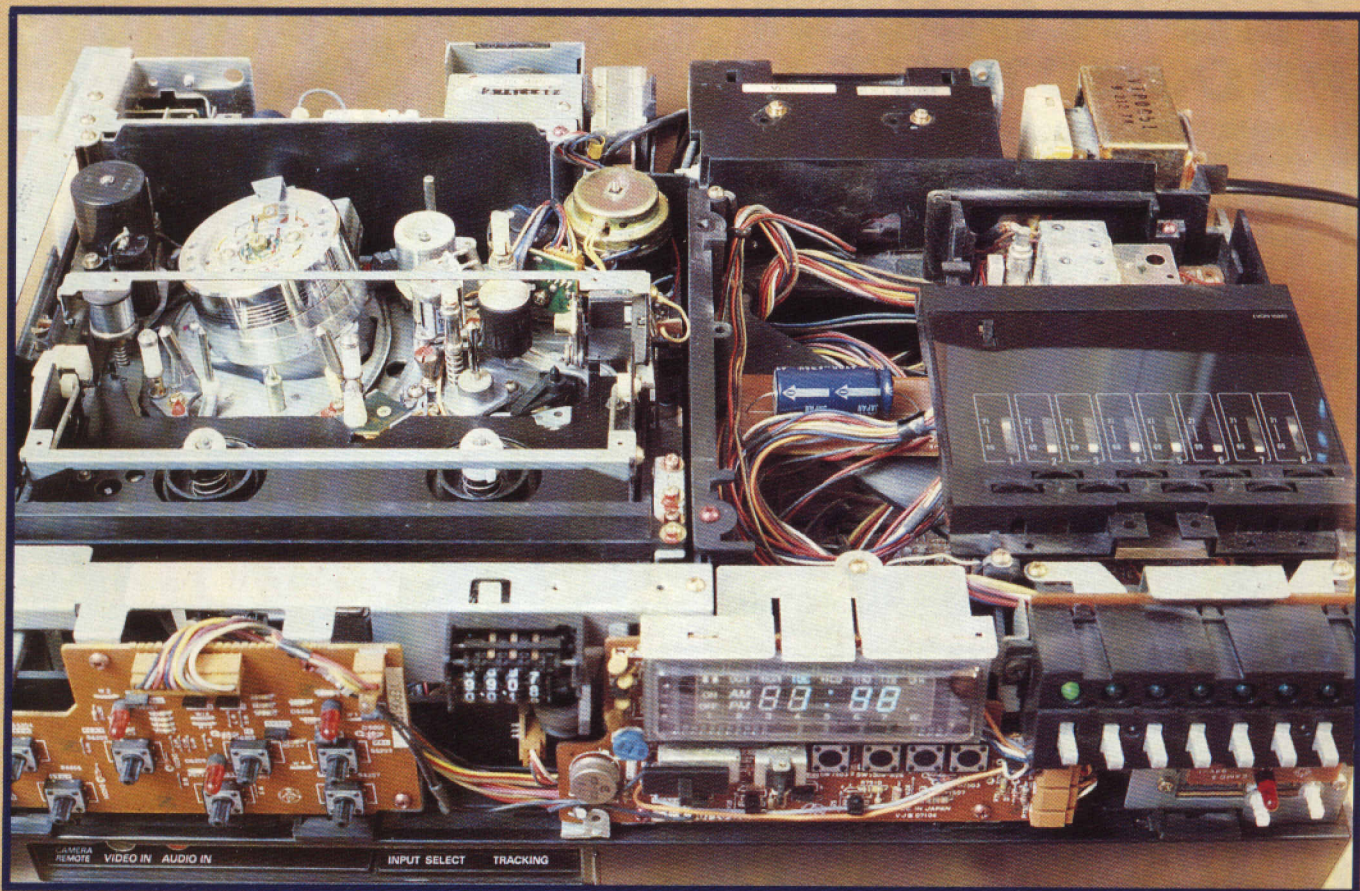


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TELEVISION

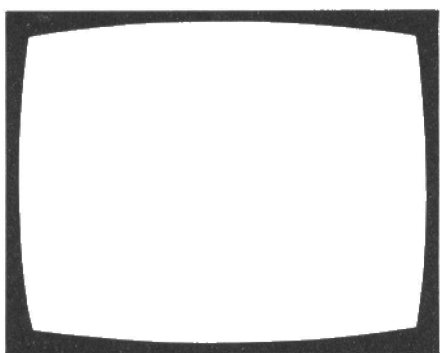
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Camera Tube Guide • Xmas Capers
More on VCR Back Tension**





TELEVISION

January
1990

Vol. 40, No. 3
Issue 471

On sale December 20th

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All correspondence regarding advertisements should be addressed to the Advertisement Manager, "Television", King's Reach Tower, Stamford Street, London SE1 9LS. Editorial correspondence should be addressed to "Television", IPC Magazines Ltd., King's Reach Tower, Stamford Street, London SE1 9LS.

INDEXES AND BINDERS

Indexes to Vols. 36 and 37 are available at 80p each from the Editorial Office (address above).

Binders that hold twelve issues of *Television* are available for £4.50 from Television Binders, 78 Whalley Road, Wilshire, Blackburn BB1 9LF. Make cheques out to "Television Binders".

SUBSCRIPTIONS

An annual subscription costs £20 in the UK, £24 overseas (by surface mail). Send orders with payment to Quadrant Subscription Services Ltd., Oakfield House, Perrymount Road, Haywards Heath, Sussex, RH16 3DH.

BACK NUMBERS

Subject to availability, copies of issues published during the last 12 months are available at £1.80 each from Television, John Denton Services, Unit 13, Thornham Grove, Stratford, London E15 1DN. Please make cheques/postal orders payable to IPC Magazines Ltd.

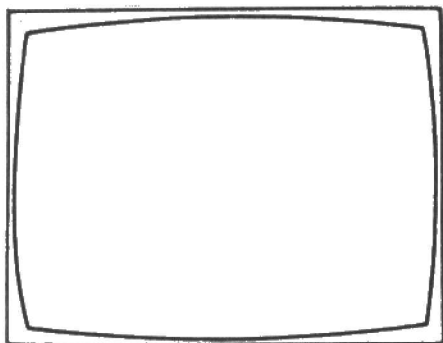
QUERIES

We regret that we cannot answer technical queries over the telephone nor supply service sheets. We will endeavour to assist readers who have queries relating to articles published in *Television*, but we cannot offer advice on modifications to our published designs nor comment on alternative ways of using them. Correspondents should enclose a stamped addressed envelope.

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OUR NEXT ISSUE DATED FEBRUARY WILL
BE PUBLISHED ON JANUARY 17



TELEVISION

EDITOR

John A. Reddihough

Please note that the telephone numbers below are for contact with the advertisement departments only. Editorial enquiries should be sent to the editor at the address given on page 177.

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PRICE INCREASE

We regret the need to increase our cover price to £1.60 from the February issue. Increased production costs have made this rise necessary.

CORRECTIONS

See page 197.

NEW PRODUCT GUIDE

For commercial reasons the CPC New Product Guide last month was not included with copies distributed overseas. We should have made this clear and apologise for any misunderstandings.

COVER PHOTO

This month's cover photograph shows a Panasonic NV2000 with its top and front covers removed. See article on pages 195-7.

On to the Nineties

As we start upon a new decade I found myself, as long-standing editors tend to do, taking a peek at what I'd written ten years ago, back in 1979. At that time considerable retrenchment was taking place in the West European CTV setmaking industry, with Japanese manufacturers having a growing influence in the UK. Since then of course the indigenous UK setmaking industry has simply faded away. There is still a large manufacturing base in the UK, with exports at record levels, but it's now entirely owned by overseas concerns. CTV sales have waxed and waned during the past decade, with a considerable boom in the late 80s. Right now of course we're in the middle of a classic "stop" phase in the stop-go cycle.

The 80s was the decade when video established itself as a standard part of the domestic scene. At the start of the decade there was still considerable uncertainty about video systems, and the video disc had yet to come and go. By the end of the decade considerable advances had occurred – S-VHS, 8mm video, the camcorder and digital signal processing for example. All at affordable prices. It all goes to show what the Japanese consumer electronics industry can achieve in terms of offering extra value for money.

How long will the present gloom last? Ferguson's spring (1989) Market Report predicted that markets would decline as a result of continuing government efforts to curb consumer spending. 1989 followed the predicted course, with the industry suffering one of its worst years in the decade. The trade balance deteriorated during the year, so the government's clamp down on economic activity has been tightened. But, with an election due in 1992, there is bound to be some relaxation – though probably not until 1991. What a dreary start to the decade! It seems that no lessons in running the economy have been learnt, the same boom and bust pattern persisting. When the upturn does come it's unlikely to be a classic boom, since the TV and video markets in the UK are now mainly replacement ones. We shall have to rely on new products for market growth. This means satellite TV, now perking up after a slow start, more sophisticated VCRs, a further increase in video photography and the prospect of HD-TV towards the end of the decade.

The technology has certainly continued on its course of rapid development. Just a few years ago satellite TV reception was an exotic activity engaged in by a handful of professionals and enthusiasts. Now it's an everyday thing that's come to be accepted as just another of the usual offerings from the industry. There's a steady increase in the number of little dishes to be seen, and installation has turned out to be a relatively routine affair. The digitalisation of TV continues apace now that the chips required have come down in price. Small LCD TV sets are now commonplace, but the c.r.t. looks set to remain the standard device for normal viewing for many years to come.

One can't see the 90s as being a period when fortunes will be made in the consumer electronics field. Satellite TV equipment for example has from the start been offered to viewers at knock-down prices. It's likely to be a tick-over decade, as we wait for the dramatic advance represented by HD-TV.

Query Service Ends

The Query Service has been a feature of this magazine for many years – since March 1951 in fact. In the early days there was a considerable call for it. Those were the days of unreliable sets that many owners could service themselves and the faults were usually easy to diagnose. It was in fact the era of the stock fault. The situation has changed drastically since those days and owner repair is now something of a rarity. There has been a marked decline in the use of our Query Service in recent years, while diagnosis via letters of the ills suffered by modern equipment has become much more difficult. With much of today's video and TV equipment successful fault diagnosis can be achieved only by someone on the spot using sophisticated test equipment. We can guess and give some general guidance about what to look for, but access to stocks of spares, service data and suitable test gear – also very often, especially with video equipment, considerable skill – is usually required to effect repairs successfully. There's also the fact that the range of equipment now encountered, with many sets continuing to work happily for ten to fifteen years or more, is so vast that few people have practical experience of more than a relatively limited range. For all these reasons the Query Service has become steadily less feasible to run and we have reluctantly decided to terminate it.

Although we may continue to include a Service Bureau page for a month or two to publish information on file, we feel that space is better devoted to our TV Fault Finding, VCR Clinic and other servicing features. These provide feedback on actual faults and their remedies rather than guesswork. Those who require a general servicing guide will find that the recently published book "Servicing TV and Video Equipment" by Eugene Trundle is an invaluable reference source. It contains a symptom index to get you rapidly to relevant information. It's published by Heinemann Newnes, Halley Court, Jordan Hill, Oxford OX2 8EJ at £25.

We must thank all those contributors who, over the years, have manned the query service on our behalf.

Camera Tube Guide

Peter Delaney, B.Sc., G8KZG

Data on TV camera tubes is not readily available. The following list of the main types of vidicon, low-light vidicon (Newvicons and Ultricons) and lead-oxide tubes (Leddicons, Plumbicons and Vistacons) has been compiled to help those who may need to replace a camera tube. The tubes are listed by diameter and grouped by their major characteristics. Within each group the tubes are listed alphanumerically: in general they are interchangeable. Notes at the end identify the more important differences.

In some cases you may find that the type number on a tube has one or more suffix letters. This indicates the grade of tube (broadcast, industrial, amateur) or the channel for which the tube is intended (red, green, blue, luminance). The suffix A is sometimes used for a more important variation and is thus included in the list below.

Except for lead-oxide tubes, which mount as listed, tubes are normally mounted from the front (lens) end of the camera. It's not possible of course to interchange tubes with different focus and/or deflection arrangements.

In case of difficulty an integral mesh tube can be replaced with a separate mesh type of similar specification by wiring G4 and G3 together on the tube base socket. Provided care is taken, it's often possible to use as a replacement a tube with a different heater rating: for example, a tube with a 95mA heater can be used to replace one with a 300mA heater by wiring a 30Ω resistor across the tube socket heater pins.

Striped filter tubes are not listed here as they must usually be replaced with a tube of the same type.

1/2in Vidicons

(1) Tubes with magnetic focusing and deflection.

9697, 9737, 9738. These tubes have a 90mA heater and separate mesh – the mesh connection is to the ring next to the target connector.

P888. Separate mesh, 150mA heater.

(2) Tube with electrostatic focusing and magnetic deflection.

XQ1600. Separate mesh; 107mA, 2.8V heater.

1/2in Newvicons/Ultricons

See note (1). The following tubes have electrostatic focusing, magnetic deflection and a separate mesh.

XQ1601. Has a 107mA, 2.8V heater.

XQ1602. Has a 95mA heater and radiation resistant faceplate.

1/2in Leddicon/Plubicon/Vistacon

P8470.

3/4in Vidicons

(1) Tubes with magnetic focusing and deflection.

E1170, M7075, P8037, TV8800, XQ1271, XQ1310,

XQ1311, 20PE13, 20PE13A, 8823, 8844, 9831. Separate mesh, 90mA heater. The **P8215** is a short, 65mm version.

XQ1270. Integral mesh, 110mA heater.

XQ1300, 20PE11. Integral mesh, 90mA heater.

(2) Tubes with electrostatic focusing and magnetic deflection.

E5045, N513, N887, S4097, S4097A, XQ1272, XQ1590, 4848, 8929, 20PE14, 20PE19, 20PE20. All have separate mesh and 90mA heater.

3/4in Newvicons/Ultricons

See note (1) at end.

(1) Tubes with magnetic focusing and deflection, a separate mesh and a 95mA heater.

S4075, TV9231, XQ1274, XQ1276 (has extended near infra-red response), **XQ1380** (has a radiation resistant faceplate), **Z7927, 20PE15, 4833U, 4905.**

(2) Tubes with electrostatic focusing, magnetic deflection, a separate mesh and a 95mA heater.

E5071, S4092 (has bipotential focusing lens), **S4102, XQ1275, XQ1277** (has bipotential focusing lens and extended near infra-red response), **XQ1278** (has bipotential focusing lens), **XQ1381, 4875U, 4904.**

3/4in Leddicon/Plumbicon/Vistacon

P8160, P8161, XQ1427, XQ1428. Separate mesh, 95mA heater, rear loading.

1in Vidicons

(1) Tubes with magnetic focusing and deflection.

OB2, OB7, P862, P864, XQ1030, 9620, 55850. All have an integral mesh and 95mA heater. The **XQ1031, XQ1032, 7262** and **7262A** are short, 5in. versions.

TH9806, TH9807, TH9808, TH9808N, TH9812, TH9815, TH9817, 7226. All with integral mesh and 150mA heater. The **TH9814** is a short, 5in. version.

C9132, C9153. Integral mesh, 300mA heater.

BC7735, HS200, HS200A, HS201, HS201A, P810, P826, P860, 4478, 4488, 7038, 7325, 7735, 7735A, 7735B, 8484, 10667. All have an integral mesh and 600mA heater.

BC4809, BC8541, C102B, C103B, C104B, C105B, P831, P833 (has mesh connection to ring next to target connector), **P842, P844, P847, P849, P8034A, P8038, P8203, P8204, P8205, XQ1005, XQ1006, XQ1007, ZQ1008, XQ1040, XQ1041, XQ1042, XQ1043, XQ1044, XQ1240, XQ1241, XQ1280, XQ1290, XQ1291, XQ1292, XQ1293, XQ1294, XQ1295, 2260, 4542** (has extended storage target), **4809, 4846, 8541, 8541A, 8604, 8626, 9677, 55851.** All have separate mesh and 90 or 95mA

heater. The XQ1285, 4569 and 4589 versions have a fibre optic faceplate. The following are short, 5in. versions: P863 (has mesh connection to ring next to target connector), P866, 9706, 9730 (mesh connection as P863), 8573A. The C23151 and C23257A are versions 4in. long.

TH9806PA, TH9807PA, TH9808PA, TH9810, TH9812PA, TH9815PA, TH9817PA, TH9818PA. All with separate mesh and 150mA heater. The TH9814PA is a short, 5in. version.

C102A, C103A, C104A, C105A, C9132A, C9133A, C23281 (has extended storage target), P8030, P8031, TH9833, XQ1001, XQ1002, XQ1003, XQ1004, XQ1050, XQ1051, XQ1052, XQ1053, XQ1054, XQ1060, XQ1061, XQ1062, XQ1063, XQ1064, XQ1065, XQ1066, XQ1067, 2255, 9728, 55852. All with separate mesh and 300mA heater. The XQ1160 and XQ1161 (both with mesh connection to ring next to the target connector) and the 4503A are short, 5in. versions.

BC8507, P841, P841X, P843, P846, P848, P848D, 4589, 8507, 8507A, 8572, 8572A, 8625. All with separate mesh and 600mA heater.

(2) Tubes with electrostatic focusing and magnetic deflection.

BC8134, 4811, 8134. All with separate mesh and 90 or 95mA heater. The 4493, 4494 and 4495 are versions with reduced target area.

(3) Tubes with electrostatic focusing and deflection.

9745. Has separate mesh and 90/95mA heater. The 9802 is a short, 5in. version.

4514. Separate mesh, 300mA heater, short 5in. tube.

1in Newvicons/Ultricons

The following have magnetic focusing and deflection, a separate mesh and 95mA heater. See note (1) at end. E5041, E5058, LLSA-100, S1200, S1201, S1202, S4076, S4119 (has extended near infra-red response), TV9901, XQ1440, XQ1442 (fibre-optic faceplate), XQ1443 (extended near infra-red response), XQ1444 (has radiation resistant faceplate), Z7975, 4532U, 4906. The XQ1445 and 25PE14 are short, 5in. versions.

1in Leddicons/Plumbicons/Vistacons

The following have a separate mesh, 90 or 95mA heater and are for front loading:

BC4892, BC4893², BC4894, P8021, P8022³, P8023², P8024^{2,3}, P8025^{4,5}, P8026^{2,4,5}, P8190⁶, P8191^{2,6}, XQ1070⁵, XQ1071⁵, XQ1072⁵, XQ1073^{2,5}, XQ1074^{2,5}, XQ1075^{2,5}, XQ1076^{2,5}, XQ1090^{4,5}, XQ1091^{4,5}, XQ1093^{2,4,5}, XQ1094^{2,4,5}, XQ1095^{2,4,5}, XQ1096^{2,4,5}.

The following have a separate mesh, 90 or 95mA heater and are for rear loading:

P8141, P8142³, P8143², P8144^{2,3}, P8145^{4,5}, P8146^{2,4,5}, P8196⁶, P8197^{2,6}, P8442⁶, P8443^{2,6}, XQ1080^{4,5}, XQ1081^{4,5}, XQ1083^{2,4,5}, XQ1084^{2,4,5}, XQ1085^{2,4,5}, XQ1086^{2,4,5}.

The following have a separate mesh, 190mA heater and are for rear loading:

P8147^{3,4}, P8148^{2,3,4}, P8490⁶, P8491^{2,6}, XQ1500^{3,4},

XQ1501^{3,4}, XQ1503^{2,3,4}, XQ1504^{2,3,4}, XQ1505^{2,3,4}, XQ1506^{2,3,4}.

30mm Leddicons/Plumbicons/Vistacons

The following have an integral mesh, 95mA heater and are for rear loading:

P8000, 4591, 4816, 55875, 55876.

The following have a separate mesh, 95mA heater and are for rear loading:

P8001, P8003², P8005⁵, P8007^{2,5}, P8131⁵, P8133^{2,5}, P8135^{4,5}, P8137^{2,4,5}, 4592, 4816.

The following have a separate mesh, 190mA heater and are for rear loading:

XQ1520^{4,5}, XQ1521^{4,5}, XQ1523^{2,4,5}, XQ1524^{2,4,5}, XQ1525^{2,4,5}, XQ1526^{2,4,5}.

The following have a separate mesh, 300mA heater and are for rear loading:

BC4592, BC4593², BC4594², BC4992⁵, BC4993^{2,5}, BC4994^{2,5}, E5040, E5055², P8008^{4,5}, P8130⁵, P8132^{2,5}, P8136^{4,5}, P8138^{2,4,5}, P8400⁵, P8401^{2,5}, XQ1020, XQ1021, XQ1022, XQ1023², XQ1024², XQ1025², XQ1026², XQ1410⁵, XQ1411⁵, XQ1413^{2,5}, XQ1414^{2,5}, XQ1415^{2,5}, XQ1416^{2,5}, 4593², 4817.

The following have a separate mesh, 400mA heater/light supply and are for rear loading:

BC4392⁵, BC4393^{2,5}, BC4394^{2,5}.

1½in Vidicons

(1) With magnetic focusing and deflection.

P8207. Has separate mesh and 95mA heater.

P8217 (with mesh connection by flying lead), 8521. These have a separate mesh and 600mA heater.

(2) With electrostatic focusing and magnetic deflection.

BC8480, 8410, 8480. With separate mesh and 90 or 95mA heater.

Notes

(1) The target with an Ultricon tube (U suffix to type number) should be set at 8-10V with respect to the cathode. Newvicon tubes are in general directly interchangeable with the equivalent vidicon with a standard target layer.

(2) Extended red response.

(3) Tube with light bias from 5V, 100mA bulb in tube socket.

(4) Tetrode electron gun (anti-comet tail tube).

(5) Tube with light bias in base. With 95mA heater tubes this is powered by a 5V, 250mA supply between pins 1 and 5. With 300mA heater tubes the power is provided by the heater circuit within the tube.

(6) Diode gun.

Whilst care has been taken with this listing of tubes that have similar parameters we cannot guarantee that a different tube type will necessarily be a satisfactory replacement.

Teletopics

SATELLITE TV

Interest in Sky Television's offerings seems to be on the increase. The number of installations surged during October to 122,000. Sky claims that over one million homes are now able to receive its service, either via a dish or cable feed. An Authorised Sky Agent scheme has been introduced. Retailers appointed as agents will receive a £25 commission for each customer they sign up as a subscriber, plus various promotional items. They will not receive extra payment for decoder installation however.

Meanwhile BSB is busy with pre-launch promotional activities. Viewers can join a "Launch Club" through retailers who participate in the scheme, paying a £10 deposit against purchase or rental of an installation. The offer will continue till the end of January. For their deposit they will be offered a free Squarial, free installation up to £60 and three months' free subscription to the Movie Channel. The viewer has to pay for the cost of the receiver of course. Ferguson has suggested a price of £259 for its first BSB receiver. Squarials are expected to sell for around £80.

Samsung has entered the UK satellite TV market with a range of dishes and receivers which are being sold as Vortec Star systems.

Chaparral Communications has opened a UK office at 10 Campbell Road, Hanwell, London W7 3EA (0157 96 587). The company was formed in 1980 and is the world's leading supplier of feedhorns. It has launched two particularly interesting items on the UK market. The 11/12 Twister feedhorn gives reception of both the 11 and 12GHz bands, enabling a single dish to be used to cover the complete Ku band. The 11/12 Twister has a suggested retail price of £125. It uses a ferrite polarity switching element that can be skewed for proper alignment with each transmission. The Monterey 20 international home satellite receiver, with a suggested retail price of £995, is designed for multi-satellite reception.

It's understood that as a fund raising measure the Bond Corporation is seeking to sell its 36 per cent stake in BSB. The Corporation's recent losses and debts of A\$8bn have led to consideration of this disposal.

BUSINESS NEWS

Following an eighteen month investigation, the European Commission has proposed that anti-dumping duties be imposed on small-screen TV sets from South Korea. The duties would have to be approved by the European governments. They range from 10 per cent in the case of Daewoo, 12 per cent for GoldStar and 13 per cent for Samsung to 19.6 per cent for smaller exporters. The initial complaint to the Commission was made by Philips, Thomson, Grundig and Nokia. European small-screen CTV imports from South Korea rose from 23,000 in 1984 to 1,083,000 in 1988. An investigation into exports from Hong Kong and China is continuing.

Alba has bought the right to use the Hinari brand name in the UK and all stocks.

The Italian government has taken a majority stake in brown-goods manufacturer Seleco following mounting losses. Electrolux, which acquired a major stake when it

took over Zanussi, plans to sell its remaining interest. The government's stake is being passed to the government-controlled holding company IRI.

CATALOGUES

The 1990 Wizard Distributors' trade catalogue is available on request from Wizard Distributors, Empress Street Works, Empress Street, Manchester M16 9EN (061 872 5438). The company has introduced a computer ordering system via a videotext operation which will also make available to users manufacturers' technical information and over 25,000 fault descriptions with remedies, covering TV, video, audio and CD equipment.

Cirkit's 1990 industrial Catalogue, with 320 pages and a newly designed layout, is now available free from Cirkit Distribution Ltd., Park Lane, Broxbourne, Herts EN10 7NQ (0992 444 111). It's divided into 28 specialised sections that give full technical and ordering details.

Bi-Pak's new 1990 catalogue is available free on request from the company at PO Box 267, Southampton SO9 7XW (0703 231 003).

ERL Ltd., 1 Moor Park Industrial Centre, Tolpits Lane, Watford, Herts WD1 8SP (0923 55 344), is now the exclusive distributor for the ECA range of semiconductor equivalents/data books. The company has available free a catalogue giving complete details of the ECA range of publications.

SERVICING AIDS

Welwyn Tool's hand-held hot-air tool for working on surface-mounted devices is now available as part of an SMD rework kit. The kit comprises a 7A1 240V Labor hot-air tool and stand, soldering nozzle, PCB holder, solder wick/gun, PCB cleaning spray can, syringe and solder paste for resoldering, magnifier and eyepiece for inspection, plus pliers, a screwdriver and tweezers. For mobility the kit is contained in a tailor-made case. The Leister Labor hot-air tool with electronic temperature control between 20 and 600°C and its extensive range of nozzles is a highly effective way of dealing with SMDs. Further details can be obtained from Welwyn Tool Co. Ltd., 4 South Mundells, Welwyn Garden City, Herts AL7 1EH (0707 331 111).

The Fast Fix TV fault card filing system available from Alan Humphreys, 13 Mansfield Avenue, St. Johns Park, Hawarden, Clwyd CH5 3SB (0244 532 961) provides a speedy means of referring to fault reports published in this magazine over the years 1981-1988 inclusive. An update pack will shortly be available covering faults published during 1989, also a new card filing system covering video faults published over the years 1981-89 inclusive.

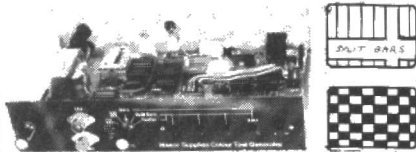
IN BRIEF

The colour TV licence fee will be increased to £71 from April 1st 1990. The monochrome licence goes up to £24 on the same date . . . Improvements have been made to the BBC's Ceefax system. The use of parallel instead of serial transmission speeds up access to pages, which are now concentrated in blocks of 100 depending on subject matter to make them easier to find. The Screenflash feature, a development of Newsflash, enables the user to find out which programme is tuned in and what precedes and follows it without losing the picture . . . The Cable and Satellite 90 Exhibition will take place at Olympia, London, from 9-11 April 1990.

MANOR SUPPLIES

**MKV PAL COLOUR TEST GENERATOR
FOR DOMESTIC TV & VCR.**

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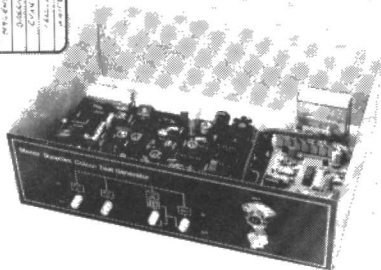


- ★ 40 different patterns and variations.
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- ★ Mono outputs with border castellations, cross hatch, grey scale, vertical lines, horizontal lines and dots.
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- ★ Easy to build kit, standard parts. Only 2 adjustments.
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- ★ Mains operated with stabilised power supply.
- ★ All kits fully guaranteed with back-up service.
- ★ Also available with VHF Modulator.

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Servicing the Panasonic NV2000/2010/3000

Nick Beer

These VCRs are now fairly old. Even when new they were somewhat sparse with respect to features, they looked pretty ordinary and required regular maintenance. So why are they still being sold in large numbers in the reconditioned market, at the same price as say an NV366 which has a much higher specification – and being snapped up as well? Perhaps it's because they are lovely machines to use and to service. They give good results and the head life is good. So they are an excellent choice for budget rental or sale. Since they are still being bought and there are no real reasons to scrap them, it's worth providing an article on servicing to help you to live with them a while longer.

The NV2000 and NV2010 are basic, top-loading machines, silver-grey in colour. The NV3000 is a portable VCR with an NV2000 mechanism, hence its inclusion in this article. This particular machine was not sold in large numbers but we do get them in, so I've provided a brief fault list at the end of this article.

Dismantling

Dismantling the NV2000/2010 is straightforward and is much the same as with its big brothers the NV7000 (see the September 1985 issue) and the NV7200. The top is held on by two bolts at the back corners: the cassette flap is held by two obvious silver-coloured bolts. With these removed, you'll find that as in the NV7000 series a red screw and a red bolt hold the screening can above the video heads/drum. The top-loading cassette carriage is held by a further four red bolts as in the NV333/NV366. The bottom is secured by six brass-coloured screws: when it has been removed the lower PCB can be hinged backwards after taking out the red screws and bolts and pushing it back and pulling it down from the front. When doing this, watch the tracking control knob – I suspect that you'll get a bit mad if you reassemble the whole thing only to find that there's no tracking knob!

Mechanical Service

When you get one of these machines it's likely that you will have to carry out a complete mechanical service (the Panasonic maintenance kit is part number VUD4087KIT). I suggest that you remove the top and bottom, unhinge the lower PCB, remove the screening can and the cassette carriage and then work first on the top of the mechanism. It'll save you time – you'll see why later.

With the carriage removed, the reel idler (VXP0329) can be replaced by removing its retaining circlip and guiding its brake arm away while you lift it off the shaft. The reel torque should be in excess of 400g/cm. It's not uncommon to find that this is very low. The brake band is held by its adjusting screw at one end and by a circlip under the back tension post at the other. So the post will have to be removed. Undo its retaining circlip and spring and lift it off. The band can then be released. The back tension should be set at 25-30g half-way through an E120 tape.

I recommend that you remove the bracket on the right-hand side at the top of the mechanism – the one that holds the loading/capstan motors, the dew sensor etc. It's secured by three brass-coloured bolts. Before doing this remove the loading and capstan belts from the motor pulleys on the underside of the mechanism. With this assembly removed you can take off the pinch roller (VXP0330) by removing its single retaining circlip and unhooking its spring. Beneath this you'll find a black plastic cover over the play idler. A single bolt secures the cover – it can be very difficult to undo due to a reaction between the screw and the chassis. Try firmly with a normal screwdriver: if it isn't easy get a very long screwdriver first rather than later – the head burrs very easily.

The play idler is available either as just the idler wheel (VXP0331), as in the VUD kit, in which case it has to be rebuilt on to its arm, or as a complete arm (VXL0763). This arm is of the same design as in the NV333/366 but with the addition of a soft brake for the take-up reel and the associated spring. To remove the arm, the pinch roller and the previously mentioned cover must first be removed. As with the NV333/NV366, when replacing the play arm ensure that it fits at the right side of the main lever underneath – use the same method as with these other machines (see the November-December 1988 issues). The take-up torque should be 130-180g/cm.

Whilst we're on the top side of the mechanism, with machines of this age you'll probably find that the hard brake pads are worn and should be replaced. They aren't in the VUD kit. Part numbers are VXZ0090 (supply) and VXZ0091 (take-up).

Video head replacement is the same as with the NV7000 and NV333/NV366 series, with two bolts and four soldered leads in this case. The discharge angle, which is secured by a single bolt, will have to be removed first of course. To simplify stock holding, the VEH0121 or VEH0103 heads can be used as replacements. The MCES Y series heads are superb replacements and offer a saving on the Panasonic ones. They are brand new, not rebuilds.

And so to the underside of the mechanism. The flat capstan belt (VDV0131) is replaced by removing the plastic cover over the pulley, the flywheel support bracket and the fan wind belt (as Panasonic call it). The latter (VDV0120) drives the reel drive assembly from the capstan flywheel. The loading belts are small and large as with the other machines we've mentioned. To replace them, unbolt the plastic guide beside the bottom of the DD unit then unclip the DD unit loom from the chassis and follow it round to the servo PCB, unplugging it here. The large belt (VDV0135) will have to be pulled up over the loom and the new one threaded over it as the loom goes through the centre of the belt's run. This palava is required because the loom isn't, as with the NV333/NV366, plugged at the DD end. The smaller belt must be replaced before fitting the new large one as it fits on the lower half of their shared loading pulley.

As with the brake band, the idlers, pinch roller etc. these belts are in the VUD kit. Two items that aren't but

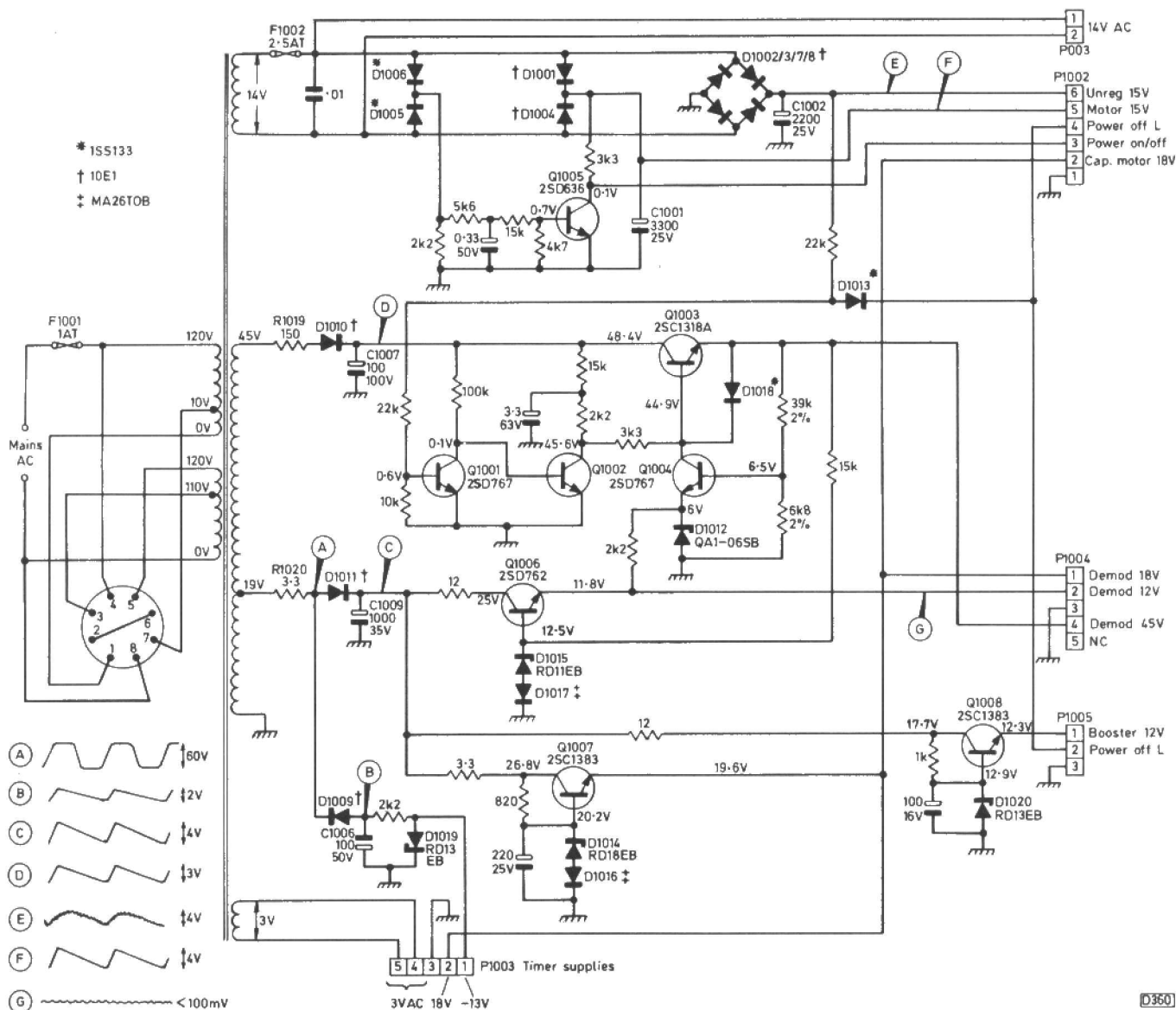


Fig. 1: Power supply circuit used in the Panasonic Model NV2000.

often need replacing are the reel pulley and the secondary pulley (VXP0351/2). These form the drive and clutch system between the belt from the flywheel and the idler itself. The clutch becomes noisy and the pulley wears. The mode switch is exceptionally reliable and thus shouldn't, as it should with more recent Panasonic models, be replaced as a matter of course.

Faults List

That sums up the mechanical side. Fig. 1 shows the power supply circuit, with some corrections with respect to the circuit in the manual. The ripple characteristics at various points are included. We'll round off with the usual faults list.

(1) **Will not, or sluggish, rewind or fast forward.** The most likely suspects are the reel idler (VXP0329) and the capstan belt (VDV0131). The clue is usually whether the fault is in both directions: if it is, suspect the idler; if it's in only rewind or fast forward suspect the belt. If the latter is o.k. check the so-called fan belt (VDV0120) and the two-part clutch gear assembly (VXP0351/2). Alternatively for no rewind and/or fast forward relay RY2001 (VSY2026) may have dirty contacts.

(2) **No clock/clock won't set/won't keep correct time.** Usually due to a faulty MN1435VX timer chip (IC7501). Sometimes ancillary components can be at fault. Check X7501, D7501/2/3 and Q7501 (2SD636). See also fault (3).

(3) **No clock, hum on E-E sound and vision, capstan servo incorrect.** All due to C1009 (1,000µF, 35V) being faulty.

(4) **Mechanics stuck in the stop mode, won't eject, otherwise o.k.** D6010 (MA165) faulty, inhibiting the loading motor. Also check the condition of the large loading belt (VDV0135).

(5) **No mechanical operation but will eject.** Cassette sensor lamp (XAMV0019) is probably open-circuit. If it's o.k., check the driver transistors Q6024/7 (2SD636/2SB641). Note that the sensor lamp is pulsed on and off, not lit continuously.

(6) **No go, no E-E, clock o.k.** No 9V as the MN1405VQ syscon microcomputer chip IC6001 is faulty.

(7) **No E-E vision.** Trace the signal path through the demodulator module. If the signal is present at TP3001, suspect IC3004 (AN6332). If not, suspect IC701 (BN5111B).

(8) **Won't switch on, clock flashing.** Fault in the 12V regulated supply. Check transistor Q1008 (2SC1383) and

zener diode D1020 (RD13EB).

(9) **No record or playback colour.** Check the following items and replace as necessary: C8035/6, D8009, IC8003 (AN6371).

(10) **Capstan rotates constantly.** Dry-joint on Q6032.

(11) **Capstan runs at high speed.** Capstan free-run control-1 R2070 open-circuit or no FG output from motor (VEM0133).

(12) **No capstan rotation.** Relay RY1's contacts dirty or coil open-circuit.

(13) **Wow on playback sound.** Check play idler (VXP0331) but usually IC2005 is faulty.

(14) **No drum lock.** Check Q2002, Q2003, IC2001, C2025/6.

(15) **No take-up.** Check play idler (VXP0331), pinch roller (VXP0332) and the loading belts (VDV0122 and VDV0135).

(16) **Snowy picture via r.f. loopthrough – looks like an r.f. amplifier fault.** Check the 12V supply to the booster. If missing check Q1008 for dry-joints on all legs and/or shorts and/or R1008 (12Ω, 0.25W fusible) open-circuit.

(17) **No capstan motor rotation.** Q2013 and/or Q2015 faulty.

(18) **Sensor lamp not working, no auto stop but mechanism works.** Q6025/6 in the syscon department faulty.

(19) **High-speed knocking with fast wind.** Replace noisy pulley/clutch VXP0351 and lubricate pinion.

(20) **"WED" partially illuminated on display.** D7513 leaky.

(21) **Cuts out on play as capstan motor stops.** Q2012 faulty.

(22) **No cue.** Q6206 faulty.

(23) **Cassette jammed, tape stuck laced half way.** Faulty loading belts.

(24) **Can't set minutes and hours change with day button.** Reset the blue trimmer R7507 on the timer PCB to give 6μsec pulses measured at the potentiometer.

(25) **No tuner or record operation.** Q1006 (2SD762) faulty.

(26) **No record colour.** Colour-killer preset R8078 noisy.

(27) **Random syscon misoperation/LEDs flashing.** Syscon microcomputer chip IC6001 faulty.

(28) **No functions with capstan motor running continuously.** R6038 (68Ω, 2W) in the 5V supply to the microcomputer chip open-circuit.

(29) **Timer microcomputer chip IC7501 fails.** Add a 10μF, 50V capacitor across C7503.

(30) **Squeaking while lacing or unlacing.** Remove reel spools and clean and lubricate the mechanism spindles. The noise usually comes from the supply spool. Be very careful not to spill oil over the drive surfaces. Use Technics RZZ0L02 #56 oil.

(31) **Squeaking in play or record.** Noise comes from drum due to discharge angle. Replace this item with the sturdier VXA1584.

(32) **Corrugated verticals and squeaking noise.** Clean or replace the erase head (VBS0014), the impedance roller (plastic type now in maintenance kit) or the audio/control head (VBR0036).

(33) **Carriage won't stay down.** Check for broken plastic lever (VXA1210) on the latching mechanism.

(34) **No deck functions.** Check the cassette down switch (VES0129) on the latching mechanism beneath the deck.

(35) **Scraping noise in play or record.** Check grease on flywheel bracket.

(36) **Wow on sound with noise bars rolling through the picture.** No capstan servo action due to absence of

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control pulses. Clean or replace the audio/control head (VBR0036).

(37) **Grainy picture.** Check the condition of the video heads and, at TP3007 and TP3008 (earth), that the record level isn't in excess of 150mV. Adjust with R3022.

The NV3000

Finally a short faults list for the NV3000.

(1) **No sound with own recordings, playback o.k.** Faulty microphone socket (VJJ0076).

(2) **No playback or E-E vision.** C3077 or IC3004 (AN6332) faulty.

(3) **No deck functions, power cuts off after a few seconds.** MN1405VQ syscon microcomputer IC6201 faulty.

(4) **Dew light permanently on.** IC6205 (AN6912) faulty.

(5) **Wow on sound, noise bars on picture.** IC2003 (AN6341N) faulty.

CORRECTIONS

Several points in the December issue require correction/amendment.

(1) The Salora J chassis was also used in some 16in. sets. The line driver transistor (last paragraph, page 102) is TB500, not TB501. Item (2) in the faults list, page 104, should have given CB400 and CB410 as being the usual causes of distorted field scan. CB410 is the scan coupling capacitor and is usually 1,000μF. CB412 is innocent!

(2) In CD Player Casebook, page 124, JVC Model XL-V2B, the tracking offset control is adjusted with TTS and TSS earthed (not TTS and TTS!).

(3) VCR Clinic, page 127, mentions the rack slider problem with the B and O VHS82. When this fault is encountered the rack slider should be replaced. It comes as a kit of parts, all of which must be fitted. This is a lengthy job and is tricky until you've done a few. A check on the rear edge of the old rack slider will usually reveal a pit or indentation which will confirm the diagnosis.

The mechanism is a Philips one, so the point is also applicable to many Philips machines, also Tatung and Pioneer models including the VR505 and VR707.

(4) The two electrolytics in the Rediffusion Mk. 3 chassis mentioned in Dave Mackrill's letter (page 108) should have been specified as 6C14 and 6C15 (6C12 does not cause this problem).

Christmas Caption Capers

Keith Hamer and Garry Smith

Once again Christmas approaches and we can look forward with confidence to watching favourite TV programme repeats such as *Mary Poppins* and the *Wizard of Oz*. They just have to be favourites, since they always seem to be shown at some stage during the festive season. There's a tradition at Christmas time for the BBC to discard temporarily the usual identification symbols and present special captions designed for the festivities. Some of the identification captions and modified test cards used over the years were featured in the May 1978 and January 1984 issues of *Television*. In this article we shall again raid the archives, which should please a number of readers who wrote in following our previous explorations.

It seems that the authors' collection of photographs and videos of the BBC's graphic design output is the most extensive in existence. Certainly the BBC does not have any photographs available. This is mainly due to the fact that most of the earlier mechanical symbols consisted of colourless bits that were held together with string and sealing wax – well, almost! Normally the identification lettering was on a piece of card positioned just in front of the working model. When viewed by a TV camera and colour synthesised (or chroma keyed) the symbol came to life, but the rough and ready nature of the symbol meant that all that would appear on a finished 35mm still camera print would be a monochrome symbol complete with unwanted joints – not forgetting the string and sealing wax... The only way to obtain a good copy of the transmitted symbol was, and still is, to photograph it live off-air or from a video recording of it. Perhaps the BBC's graphic design department staff didn't have the time to make such a copy, so the task of keeping a permanent record has fallen on those keenly interested in the subject.

BBC Xmas Captions 1969-1976

The earliest example of a Christmas symbol in our collection dates from 1969, see Photo 1. Based on the ever-faithful globe caption, which was first used in 1963, it's a special version which was used to announce with pride that the majority of the BBC-1 Christmas programmes were in colour, following the official start of colour transmissions (BBC-1) on November 15th, 1969. The curved mirror that was normally placed behind the globe to give it an iced-cake effect was replaced with dozens of what appeared to be loose fitting sequins. These moved as a result of vibration, catching the light to give a very colourful effect. As far as we can tell the globe differed from the standard one in that it was illuminated externally and was actually coloured rather than colour-synthesised.

The following year saw a variation on this theme. The standard globe, which was approximately three inches in diameter and lit internally, was used with the set of sequins replaced by small reflective snow flakes. See Photo 2.

It would seem that in 1971 the graphic designers were perhaps running short of ideas, time or inclination. The highly coloured globe from 1969 was hurriedly pressed

into service, with 1970's reflective snow flakes. Photo 3 shows the result. There wasn't any great abundance of Christmas cheer over at BBC-2 either. The standard revolving cubed 2 was used, but with coloured swirls that emanated from the centre. Just in case anyone didn't notice the change, the revolving 2 had "Christmas" underneath.

What would the graphic designers come up with for BBC-2 in 1972? Easy: use the normal revolving 2 symbol, add a little tinsel around the edges, include the word "Christmas" and there we are. Who could ask for anything more? One curious thing about this caption, see Photo 4, was the inclusion of the wording "in colour". Curious because BBC-2 had officially been in colour since December 2nd, 1967.

Christmas 1972 was one of the rare occasions when the BBC's designers produced a variation on the clock caption, which for some reason was normally left well alone. This particular effort, see Photo 5, used the standard mechanical clock with an abstract, snake-like design around the edge. If you are wondering what the BBC-1 caption was in 1972, so are we! It's one of the few that seem to be missing from our collection. If anyone has details or a copy, please write in.

In 1973 BBC-1 departed from using the traditional globe symbol. Instead, a group of Dickensian carol singers revolved during each programme link – see Photo 6. On BBC-2 the graphic designers went berserk, festooning the revolving 2 symbol with glittering stars. This caption also included a dazzling ball within the 2. See Photo 7. An unusual feature was the inclusion of the day (Christmas Eve, Christmas Day and Boxing Day).

Unfortunately Christmas 1974 is a total blank as far as our collection is concerned. So once again if anyone has a photograph that captures the proceedings, please let us know. We come next to 1975 and, surprise, surprise, the good old globe caption reappeared, looking remarkably (see Photo 8) like the one used in 1971 despite the different style of identification. It was a very colourful symbol however, and top marks must go to those concerned with the design. This was in fact the last time that a single globe was used at Christmas.

On BBC-2 a tinselled 2 emerged on Christmas Eve 1975, at the unveiling ceremony, see Photo 9. Unfortunately this was still the pre-VCR era, so we don't have a video recording of it. Knowing the ingenuity of the graphic designers however we suspect that the 2 symbol revolved in some way.

The final year's efforts featured in this article were in 1976. Exactly the same style of identification was used on BBC-1 as in the previous year, but the globe was replaced by a large rotating snowflake, see Photo 10. The curved background had also received treatment. Once again an extremely colourful Christmas caption had been concocted. The designers were obviously proud of their identification, because 1976 was one of those very rare occasions when even the clock caption had the logo changed – see Photo 11.

BBC-2 went psychedelic in 1976. The usual revolving 2 symbol was used, with odd lines going one way and even ones the other, but for Christmas weird and



Photo 1: BBC-1, 1969.



Photo 2: BBC-1, 1970.



Photo 3: BBC-1, 1971.

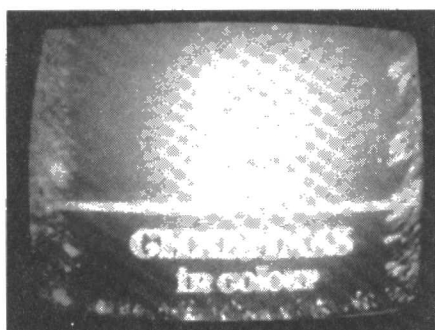


Photo 4: BBC-2, 1972.



Photo 5: 1972 Xmas clock.

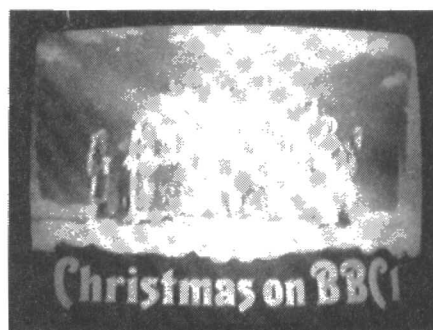


Photo 6: BBC-1, 1973.

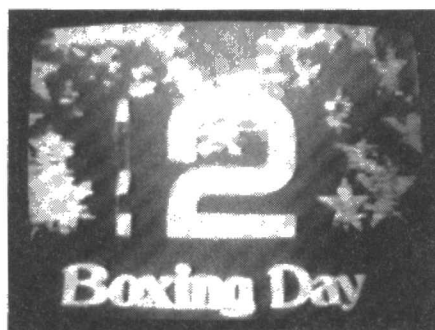


Photo 7: BBC-2, 1973.



Photo 8: BBC-1, 1975.

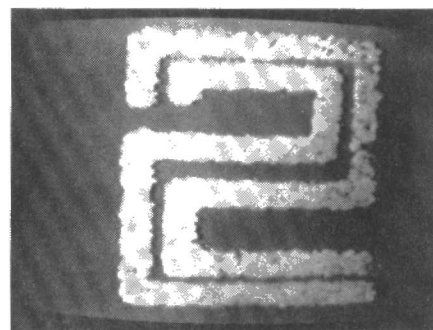


Photo 9: BBC-2, 1975.



Photo 10: BBC-1, 1976.



Photo 11: 1976 Xmas clock.

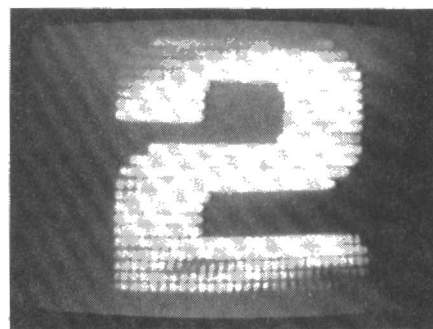


Photo 12: BBC-2, 1976.

wonderful colours emerged to give a very pleasing effect. Photo 12 shows the result. Unfortunately the full effect cannot be conveyed by a monochrome photograph, but viewers without a colour telly had the same problem and had to use their imagination.

In Conclusion

That completes our review of BBC Christmas captions from 1969 to 1976. Had space permitted we could have

gone on to tell you about Santa's revolving head or the melange of medieval trumpeters, but you'll have to wait till another time. Don't forget: if you have any photographs or video recordings of pre-1980 BBC captions or test cards, please send us details. In particular we're trying to track down a video recording of the 1963 BBC Schools pie chart/grey scale tuning signal plus any music used with the BBC Test Card C. If you can help, please write to Keith Hamer, 7 Epping Close, Derby DE3 4HR, or telephone 0332 513 399.

Hinari DSK2 Midi System

A stock fault seems to be developing on the Hinari DSK2 midi system – we've had three of them in recently, all suffering from the same problem. The reported symptom is usually "won't play any disc". When you've finally managed to get the CD section into a position where you can service it, something that's not easy, you can see that when the tray is closed with a disc in it the turntable doesn't rotate. If the disc is removed and the tray is closed the optical assembly lens doesn't move up and down to achieve focus. I have to stress that you mustn't stare at the beam emitted from the lens: you can see from side viewing whether the lens moves or not.

Since the turntable won't rotate until focus has been achieved, one's first suspicion would be that there's a focus drive fault. You'll find IC803 (STA341M) mounted on the PCB beneath the laser assembly: a scope connected to pin 6 of this chip should show the focus drive waveform. In each of the cases we've had the waveform was present right the way through to the optical assembly, though no movement of the assembly was apparent. We found that in each case a delicate touch on the lens with a cotton bud produced three or four focus coil movements. In one case a tiny drop of thin oil applied to the focus coil pivot restored normal operation. It's not a good idea to go pouring oil into laser assemblies, but on this one occasion it did the trick.

As yet I've not been able to prove that the laser assemblies have been faulty. It would seem that the focus coil does give problems, but our customers have not accepted the repair estimate as the laser assembly is expensive. I'd be interested in any comments from other engineers with experience of these players. Maybe someone has actually replaced an optical unit to clear this fault. Other engineers have told me that the turntable motor gives problems. Usually the disc will start to rotate, but does so very slowly then stops. A replacement turntable motor should cure this fault.

M.L.

Philips CD104

This one proved to be a difficult fault. It eventually turned out to be man made. The symptom was that the player wouldn't play past track five. There was variation from disc to disc, but towards the end of track four dropouts would occur and the machine would eventually shut down in the stop mode.

Our first move was to scope the h.f. eye pattern at pin 7 of the SAA7010 demodulator chip on the decoder panel. It was unstable, and I felt that the fault was probably mechanical rather than electrical. This was mistake number one.

Slight pressure applied to the centre of the disc clamp during play seemed to cure the trouble. I stripped the clamping mechanism to see if it was bent or disfigured in any way, then swapped over the whole clamping mechanism with one from a working machine, but no joy. As before however pressure on the clamp cured the fault. The next step was to scope the motor control waveform at pin 4 of the SAA7020 chip. It feeds the turntable motor control servo and in turn the motor, and

was extremely unstable. Still suspecting a mechanical fault I changed the turntable motor, but the fault persisted.

Back to the servo board to take another look at the motor control waveform, which in Philips machines is referred to as MCES (motor control from error correction to servo). This MCES waveform enters the turntable servo via a low-pass filter that consists of C2218, C2219, R3260, R3261 and the MC1458 dual operational amplifier chip IC6209. The voltages around this chip were all slightly wrong but were not too far out. There are two zener diodes in this circuit, and these are both critical for correct operation of the servo. They should both be 2V zener diodes but someone had replaced them with 2.5V types. Fitting 2V zener diodes cured the problem.

M.L.

Philips CD150

The complaint with this one was poor tracking when warm. We played the machine for three-four hours and everything seemed to be o.k. In fact it wasn't until the machine had played for about six hours that a fault appeared – it started to skip and jump.

Next morning we checked the laser current when cold. To do this you connect a d.c. voltmeter across test points 1 and 2, i.e. across resistor R3102 on the servo panel underneath the turntable, and play track 1 of the Philips test disc. The meter should read 50mV \pm 5mV. If you don't get this reading, adjust potentiometer R3106 on the servo panel *carefully* until a reading of 50mV is obtained. As this setting was correct we ran the player again all day. Once more the fault appeared after about six hours. We checked the laser current again: bang on 50mV.

The TDA5708 photodiode signal processor produces the focus error signal for the focus drive circuit and also the RE1 and RE2 radial error signals for the TDA5709 radial error processor. It was this chip that turned out to be the culprit. A touch of freezer on it restored normal results for several minutes, a replacement providing a complete cure.

We were lucky with this one. It's been my experience that freezer doesn't always provide much help in this application. It was however a heat related problem, as we proved with the hairdryer before ordering the replacement chip.

Incidentally all the chips used in Philips players are available from CPC Ltd., 186-200 North Road, Preston, Lancs PR1 1YP.

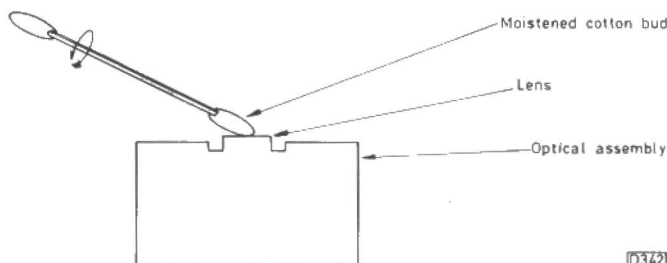


Fig. 1: Recommended method of cleaning a laser lens.

Note that you should be very careful when using a hairdryer for fault-finding. Keep the heat well away from the laser unit as excessive heat can damage it. Be careful of the flex print too. In the above case we were able to prove the cause of the fault only by disconnecting the servo board from the laser flex print, heating the chip and then reconnecting the board again.

M.L.

Marantz CD45

This Philips-based player was part of a midi system that had suffered lightning damage. Fortunately all the items in the system are separates, otherwise we wouldn't have even considered the repair. All items other than the record deck were faulty. We removed the CD player from the rest of the system and switched on. The result was that the tray opened by itself and the display resembled Blackpool illuminations! Then the tray wouldn't close. We checked the power supply rails which were all o.k., so the MAB8441 control and display microcomputer chip on the front control panel was the next suspect. Fitting a replacement restored normal operation.

M.L.

Cleaning Laser Lenses

I've discussed cleaning the optical assembly with several engineers. Some use a fine soft brush while some use a soft cloth with some sort of cleaning liquid, all with varying degrees of success. It's difficult to clean anything without applying pressure, but too much pressure can damage the optical lens, rendering it useless. The safest method I know of is as follows.

First try to remove the disc clamp which can get in the way. Then slightly moisten one end of a cotton bud in alcohol and lightly roll the bud over the lens. When the lens is clean, use the other end of the cotton bud to dry it completely to avoid smears etc. I've found this to be a very effective method as it requires very little pressure. See Fig. 1

M.L.

Technics SLXP7

This portable CD player came into our workshop with no-play symptoms. Another servicing company had said a new laser assembly was required. The customer commented that it used to play some discs all right but on others it would mistrack and would not select tracks after the TOC had been read. When he got it back with the £85 estimate it wouldn't work at all.

A quick check revealed that the r.f. (eye pattern) waveform was present at pin 15 of IC301 (AN8371S). It was extremely poor however and the laser didn't read the TOC. I was beginning to suspect the laser myself when I spotted the cause of the problem – all the mechanical adjustments on the laser assembly had been twiddled. The seals on the turntable height and pickup angle adjustments had been broken. Luckily I was able to match up the position of the turntable height screw by the shape of the broken paint around the screw head. After this the machine played but the sound was poor, with dropouts, and it took some twenty seconds for the TOC to be read. The r.f. pattern was still very poor, but fine adjustment of the two angle settings produced a much better waveform. When we'd gone through the whole set-up procedure the player produced very good results. After about five minutes of play however the front display started to show incorrect track numbers

and playing time, coupled with flashing numbers on the left-hand side. A small spray of freezer on the MN6617 digital signal processing chip IC601 corrected the display, so a new chip was ordered. When this had been fitted (all 84 pins . . .) the player was returned to a very happy customer with a bill for far less than the original quote.

Two weeks later the volume control fell to bits. Still, you can't win 'em all!

M.L.

Pioneer PD-M50

There was a shimmering display with a slow key scan – denoted by the very slow action of the buttons, i.e. having to keep your fingers on for ages. The cause was a faulty crystal oscillator timing circuit within IC3 (CXD1135QZ).

A similar fault but this time with a strobing rather than a flickering display (lower frequency) was caused by IC6 and its crystal X3 being faulty.

These faults could also occur with the PD-M40.

N.B.

Sony CDP35

The loading belt, part number 3-653-387-00, is a weakness in this model. Check it if the tray doesn't load or unload fully or the clamping arm doesn't lift fully.

If the main PCB is not screwed in, ensure that it's earthed at all four points, using jumper leads, when taking measurements or carrying out adjustments.

N.B.

Sony CDP-M20S

Intermittent low and very distorted sound was traced to IC9 (M515651) being thermally defective. A hairdryer and freezer were the most sophisticated items of test gear used for the diagnosis! Shame that this isn't the case every time.

N.B.

Sony D50

There are two versions of this player. This fault affects the Mk. 1 version which has a standard d.c. spindle motor. The symptoms are sluggish disc rotation or complete failure of the disc to rotate. Removal of the toothed belt will appear to show that there's plenty of torque, but nevertheless the motor is the cause of the trouble.

N.B.

Technics SLP-J22 Series

I've had one or two of these units with breaks in the optical unit's FPC. The symptoms have been no disc rotation due to no laser output, or intermittent skipping and/or returning to the TOC.

N.B.

Pioneer PD-X77

The disc went in and the display worked but the disc didn't rotate. A quick check using my new credit-card type detector showed that there was no laser output, though the LD-on signal from the syscon microcomputer chip was present. The logical conclusion was a broken FPC, and a new optical unit (PWY1003) got things going – the laser diode could have been faulty of course. When the machine was set up we found that the new optical unit also cured the playability faults the customer had complained about prior to the complete breakdown.

N.B.

Bandwidth Compression Techniques

Part 2

Tom Ivali

In this concluding instalment we'll look at bandwidth compression schemes intended for television broadcasting.

Analogue Coding Proposal

At about the same time that Bell Telephone Laboratories devised the experimental Picturephone system (see Fig. 4 and the associated text last month), Gouriet (BBC) and Cherry (London University) proposed an analogue coding scheme. This reduced the horizontal pixel-to-pixel redundancy by adaptively varying the speed of the line scanning. In this way more time was made available for transmission of the high-information parts of the picture while less time was taken to transmit the low-information parts.

The high-information parts of the picture are where there are sharp and frequent transitions between different brightness values. So the scanning beam's velocity is varied in accordance with the sharpness, or slope, of the waveform. Fig. 6 shows the basic idea. A differentiating circuit is used to measure the slope of the video waveform. It then determines the scan velocity. Thus the steep slope of a sharp edge tends to slow the beam down. As a result the slope itself is reduced until it settles down at an equilibrium value. Conversely a gentle slope makes the beam move faster.

The arrangement is a closed-loop control system in which the beam's velocity is controlled by a function of itself. Overall the effect is to smooth out the waveform and hence the information rate. The velocity of the scanning beam in the receiver is varied in synchronism, the information for doing this being derived from the modified slopes of the received waveform.

Early Digital Proposal

A later bandwidth compression scheme intended for broadcast-quality TV was devised by Wendland and May of AEG-Telefunken. This took advantage of intra-field pixel-to-pixel redundancy in the picture as well, using digital techniques and an adaptive form of differential pulse code modulation.

The system transmits only "relevant" information. This is continuously selected as the picture changes, the selection being based on a relevance criterion derived from the characteristics of human vision. In this way the system is able to exploit the eye's relative insensitivity to noise and distortion at edges and areas of high detail, as previously discussed. "Relevant" information consists of those pixel-to-pixel differences that exceed a threshold value which varies in accordance with the amount of detail in the picture. The encoder employed a relevance detector and a system using a buffer store to smooth out the transmitted information rate so that no sudden bursts of high digit rates that would exceed the channel capacity could occur.

Two techniques were used to achieve a constant-rate data output from the buffer store. Under-flow of digits was avoided by generating and feeding into the buffer "stuffing" code words. Overflow of the buffer as a result

of an excessive rate of input digits was avoided by means of feedback from the buffer store to the relevance detector. The feedback signal depended on the number of digits held in the buffer. It controlled the relevance detector so that the output from this was limited as necessary. The developers claimed that the adaptive coder gave a data compression ratio of 5:1 relative to a 7-bit p.c.m. digitised TV signal.

Recent Systems

We'll complete this survey by taking a look at how the general principles of bandwidth compression previously outlined are used in some recent TV systems. As examples we'll consider a modern telecoms codec (coder-decoder) for videoconferencing and a system under development for HD-TV broadcasting.

Videoconferencing Codec

The videoconferencing codec was initiated by British Telecom but later became part of a joint European research project. It's now used by telecoms authorities throughout Europe as standard equipment in both national and international teleconference networks. The equipment accepts a standard 625-line colour video signal, applies compression and transmits the result as a p.c.m. digital code at a standard bit rate of 2Mbit/s. This standard was adopted by the Conference of European Postal and Telecommunication Administrations (CEPT). It represents a 40:1 compression of the conventional p.c.m. data rate that would otherwise be required for a 625-line signal.

Bandwidth compression is based on the fundamental principle, already outlined, of transmitting only those parts of the image that change from picture to picture. This is done by a system called conditional element replenishment – the "element" being a picture element or pixel. Two reference pictures are stored digitally, one at the transmitter/encoder and the other at the receiver/decoder. At the transmitter the incoming picture, which is digitised, is compared with the stored reference picture. When the system detects a change between these two pictures it transmits data representing this change. The change information continually updates, or "replenishes", the two references stores so that they always contain the current picture. Because the change information is an uneven data flow it has to be smoothed out for transmission. This is done by a digital buffer memory that receives the varying inflow but feeds out the data at a uniform rate.

Fig. 7 shows the essentials of the conditional replenishment encoder. As can be seen, it employs differential pulse code modulation. The analogue waveform is first digitised by an AD converter (this is not shown). The resulting 8-bit p.c.m. data stream is then fed into a two-dimensional (spatial, temporal) digital filter which processes the image to remove noise and improve the performance of the subsequent movement detector.

Moving areas of the picture are predictively coded by a d.p.c.m. encoder. This is followed by statistically

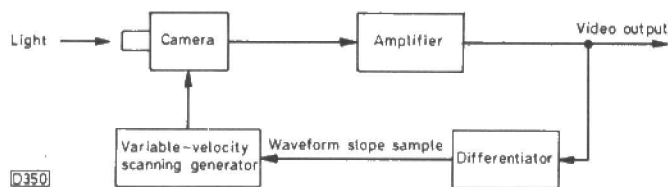


Fig. 6: Outline of a proposal for broadcast TV bandwidth compression based on the principle of varying the camera's scanning velocity automatically in accordance with the information rate (instantaneous slope) of the video waveform.

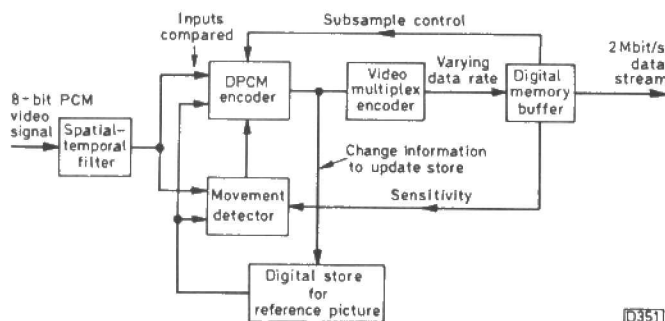


Fig. 7: Conditional element replenishment principle which is in current use in a standard telecommunications codec for videoconferencing. Reference pictures stored at the encoder and decoder are updated as picture-to-picture changes occur. Only the changes are transmitted.

matched variable length coding. In the event of a lot of movement, the resolution of the transmitted moving area is decreased by subsampling in an adaptive manner to take advantage of the fact that the eye's ability to perceive detail decreases with increasing speed of movement.

With a relatively still picture the encoder generates false moving areas to ensure that the transmitter's buffer doesn't under-flow and to replenish the picture stores at the transmitter and the receiver over several seconds to remove distortion caused by coding or transmission errors.

Control of both these modes is achieved by monitoring the content of the transmitter's buffer.

The video multiplex coder shown in Fig. 7 combines addressing data with each moving area and introduces special line and field start codes to ensure that the receiver is kept in synchronism.

For colour information an input processor either converts a composite analogue waveform into separate luminance and chrominance components (Y, U, V) or matrixes separate RGB inputs to produce YUV. It then converts these components to a digital form. The U and V chrominance components are coded in the same way as the luminance component Y.

Decoding at the receiver is of course the reverse of the encoding process shown in Fig. 7.

This codec with its bit rate of 2Mbit/s represents current practice in video telecommunications. Recently developed compression equipment is capable of operating at even lower information rates however, giving as good quality videoconference pictures at 320kbit/s as the 2Mbit/s ones and passable videophone pictures at only 48kbit/s.

Current Research

Video telecommunications research aims to reduce the bandwidth even further, employing the principle of

sending digital code words to indicate features in a picture rather than transmitting in code form the actual pixels that form these features. Thus in the case of a speaking human face it might be possible to distinguish by pattern recognition ten or more different mouth positions and send a code word for each position as it occurs. A synthesiser at the receiver would produce the appropriate pictures of mouth positions in response to the received code words.

Compatible HD-TV

HD-TV broadcasting systems use bandwidth compression to achieve compatibility with standard DBS channels, signal formats and existing TV receivers. This means that the bandwidth compression system must enable HD-TV pictures with twice the vertical and horizontal resolution of a standard TV picture, i.e. with four times the total information, to be transmitted within the 24MHz or 27MHz f.m. channels laid down in the WARC 77 frequency allocations for DBS in the 12GHz band. These channels allow basebands of about 11MHz.

To achieve the required resolution, the HD-TV picture source generates signals with a bandwidth of about 30MHz for 2:1 interlaced pictures or 60MHz with sequential scanning. With both the Japanese MUSE system and the European Eureka 95 system the bandwidth compression applied gives a reduction of 4:1. The digital signal processing that achieves this reduction has two main functions, first to remove redundant information from the picture and secondly to spread selected parts of the resulting vision information over an extended period of time. The digital processing involves sampling and quantisation plus subsampling, which is resampling at a lower rate.

The Eureka 95 System

The compatible Eureka 95 system is based on an interim production standard with the following parameters: 1,250 lines interlaced 2:1; sampling at 1,440 pixels per line; a field rate of 50Hz; and a picture aspect ratio of 16:9. The redundant information which is discarded consists of diagonal image detail and fine movement detail that cannot be detected by the eye. Two two-dimensional digital filters perform this elimination task by appropriate spectrum shaping. A two-dimensional filter is one that operates in any two of the three TV picture dimensions – horizontal, vertical and time (a conventional filter such as a low-pass type is a one-dimensional filter: it modifies the vision bandwidth and thus affects the resolution in only the horizontal dimension).

As previously mentioned, the eye is less sensitive to fine detail lying in diagonal directions across the picture than to fine detail in the vertical and horizontal directions. So this fine detail is filtered out by the two-dimensional filters, leaving the vertical and horizontal resolution unchanged. Use of a method of subsampling called offset or quincunx sampling enables bandwidth compression to be introduced.

Fig. 8 shows at (a) a conventional orthogonal sampling pattern applied to a picture and at (b) the corresponding offset or quincunx pattern. The term quincunx refers to the repeated arrangements of five samples, like the five dots on one face of a gaming die, that can be discerned in this pattern. The quincunx method of sampling improves



Fig. 8: Subsampling patterns used for HD-TV bandwidth compression. (a) An orthogonal pattern. (b) An offset (quincunx) version of (a). The coarser quincunx pattern shown at (c), using a lower subsampling rate, results in a reduced bandwidth requirement.

the horizontal and vertical resolution relative to orthogonal sampling but reduces the diagonal resolution. It's possible therefore to use a coarser quincunx pattern as shown at (c). This coarser pattern provides the original horizontal and vertical resolution, corresponding to (a), while giving reduced diagonal resolution. Since the eye is relatively insensitive to diagonal detail this loss due to the sampling action doesn't matter. The system uses diagonal filtering to obtain this diagonal sampling loss. The result, as shown at (c), is a sampling pattern with half the number of samples for a given area of picture. This of course means that the sampling rate is halved. Accordingly this process reduces the bandwidth requirement by a factor of two.

Luminance Encoding

Fig. 9 shows the essentials of the Eureka 95 luminance signal encoding system. The analogue luminance signal from the 1,250-line picture source is first digitised to 8-bit resolution at a sampling rate of 54MHz. This is four times the CCIR digital coding sampling rate of 13.5MHz for luminance, and has been chosen because of the 4:1 compression that follows, thus retaining the CCIR coding standard.

The reduced-bandwidth signals produced by the two two-dimensional filters are next resampled at this lower frequency of 13.5MHz. This resampling is of course performed on the luminance signal in 8-bit digital form. The lower rate resampling (subsampling) is arranged to spread the samples over a longer period of time – in this case over four transmitted fields. Thus for transmission the information in each incoming interlaced picture of two fields is distributed over four fields. Since the time taken for each picture is doubled, the information rate and hence the bandwidth requirement is halved. This gives a second bandwidth reduction by a factor of two, providing a total bandwidth compression of 4:1.

The process is effective for bandwidth compression with stationary pictures and static parts of pictures containing movement, but introduces a loss of resolution in moving parts of the picture. So the two subsampled signals are next passed to a section of the bandwidth

compression system that exploits the eye's insensitivity to high spatial frequencies in moving parts of the picture. The purpose of this section is to select dynamically from the two filtered inputs an optimum signal, depending on the nature of the picture content, for transmission. It also produces a digital assistance signal which carries instructions for controlling the decoding system in the receiver.

At this stage the luminance and chrominance signals are still on the 1,250/50/2:1 standard, though in sampled and digitised form, with the subsampled signal samples distributed over four fields as already mentioned. To achieve compatibility the 1,250-line signal must be converted into the 625-line format. This is done by a process called line shuffling. The line shuffler rearranges, in a four-field sequence, samples from two successive lines in each field of the 1,250/50/2:1 picture to produce one line of a 625/50/2:1 picture. Samples from odd-numbered fields are transferred into one 625-line field while samples from even-numbered fields go into the next, interlaced 625-line field.

After this line shuffling the resulting 625/50/2:1 luminance signal, along with the U and Y chrominance signals not shown in Fig. 9, is fed to a MAC encoder. This compresses the Y, U and V signal components in time and rearranges them as a time-division multiplex, all by digital processing.

Wide Aspect Ratio

The wider 16:9 aspect ratio generates extra picture information relative to the standard 4:3 aspect ratio. In the high-definition MAC encoding equipment developed by the IBA this extra information is accommodated by time compressing the luminance signal by a greater amount – a factor of 2:1 (with 4:1 colour) is used instead of 3:2 (colour 2:1) with a conventional D-MAC encoder.

The Problem of Movement

The Eureka 95 system compresses the bandwidth by taking a longer than normal time to transmit the samples that comprise one complete picture, spreading them over four fields. This affects picture quality. It gives no trouble in static parts of the picture, but in moving parts it causes loss of resolution or blurring. This is obviously not acceptable for HD-TV purposes. The Eureka system has to use additional signal processing therefore to combat this impairment where movement is present. In the provisional system demonstrated at Brighton in September 1988 a motion-adaptive method of encoding is included to mitigate the problem.

In stationary areas of the picture this technique uses the four fields of samples to construct an image with high spatial resolution but poor temporal resolution. In moving areas it uses one field of samples to construct the

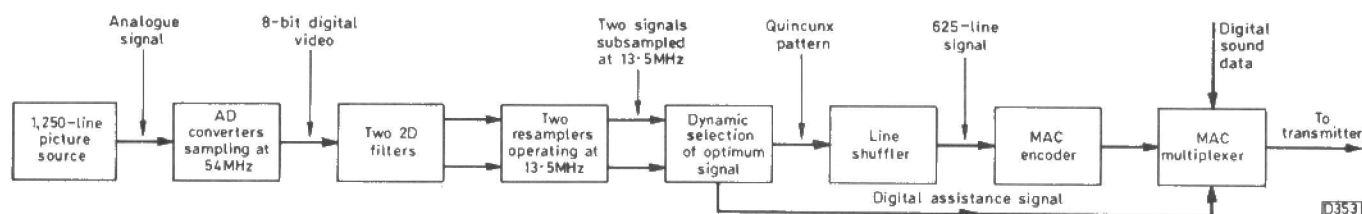


Fig. 9: Block diagram showing the main signal processing arrangements used for bandwidth compression in the Eureka 95 compatible HD-TV system. For simplicity only the luminance chain at the transmitting end is shown – this is the most critical part of the system for image resolution.

picture, the result being reduced spatial resolution but good temporal resolution. Whichever of these modes gives the better result at a given moment is selected automatically by the motion-adaptive system.

There is still an objectionable loss of resolution in areas with movement that the eye can follow, such as a slow sweep of someone's hand. Further development aims to overcome this problem by using a more refined system called motion-compensation. This measures the speed and direction of motion in small sections of the picture continuously. These "motion vectors" are transmitted to the receiver where they control digital processing circuits that enable the moving areas to be reconstructed with the same high resolution as stationary areas.

Motion-compensation is also being developed for use with visual telecommunications systems of the conditional element replenishment kind shown in Fig. 7. One purpose of this is to improve the prediction of the system and thus reduce the amount of change information that has to be transmitted.

HD-TV MAC Receiver

The digital signal processing operations shown in Fig. 9 are reversed in an HD-TV MAC receiver. This is a straightforward business: the AD conversion is reversed by DA conversion, subsampling by up-sampling, line shuffling by deshuffling and so on. The transmitted samples spread over four fields are collected together in a semiconductor memory.

We've come a long way since the proposal for bandwidth compression with mechanical scanning!

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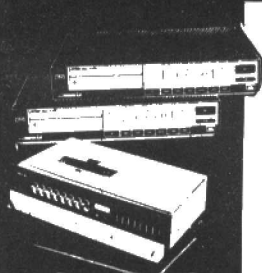
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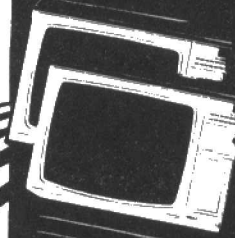
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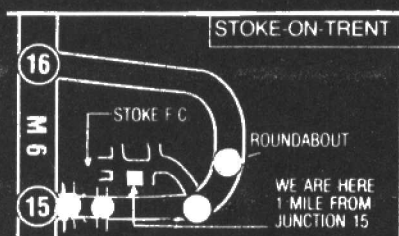
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VCR Clinic

Reports from Philip Blundell, Eng. Tech., Eugene Trundle, K. Rutherford, Ian Bowden, Jim Littler, Stephen Leatherbarrow and Nick Beer

Hitachi VT33

The problem with this machine was intermittent loss of the E-E and playback picture. The video signal was present at IC202's output but was missing at pin 8 of plug PG233. It was being lost at Q210 whose base voltage was low at 1V instead of 6-7V. Tracing back we found that Q224's base voltage was also low. The culprit was C292 which was leaky.

P.B.

GEC V4007

This machine and the Philips equivalent can suffer from broken wires to switch COD3. The symptoms are acceptance of the cassette which is then immediately ejected. The wire usually breaks where it connects to the small PCB under the deck.

P.B.

Panasonic NV730

The weakness of the worm-wheel unit, part no. VXP0575, fitted to the front-loading mechanism in this machine was mentioned on page 20 of the November issue. A possibly puzzling symptom associated with this and other front-loading assembly faults is that the left-hand side supply spool rotates backwards for several seconds before auto-shutdown of the machine.

E.T.

Sanyo VHR3300

The symptoms were no off-air signals, failure to tune, and the orange channel display was both dim and flashed on-off. The rest of the display was also dim, though the machine provided good playback. We found that the -30V supply to the display/key board was low at -12V because R5008 (47 Ω , safety type) on power panel PW1 was open-circuit. No overload could be found and the replacement resistor has not failed.

E.T.

Hitachi VT88

This was an unusual fault. With certain tapes there was slight horizontal picture instability, especially near the bottom, and the tracking was critical for hi-fi sound. We found that the sealant used in the factory to seal the exit guide screw top had run down and formed a blob on the guide's nylon sleeve. This also prevented the sleeve from rotating.

E.T.

Panasonic NV-L20

We've had a couple of these machines with the back-tension arm stiff on its pivot. The effects are failure to erase previous recordings, picture rolling, and virtually unwatchable own-recordings. The machine usually works fine when it's stood on its left-hand side! The cure is to remove the lever, check that the box-section at its pivot end is square, and reassemble with a drop of lubricant.

E.T.

Panasonic NV-MS1

Modern full-feature S-VHS camcorders are complex animals. This one had an intermittent problem - failure, sometimes, to display white-balance information in the

viewfinder. The actual white-balance operation, auto or manual, was fine. It took us a long time to find out where these captions come from! There's no separate character generator chip in this machine: the operation is carried out inside the main microcomputer chip IC6001 on the syscon panel. Replacement of this chip, using a mighty magnifier, restored order to the viewfinder readout.

E.T.

JVC GRC9, GRC11

If you encounter one of these camcorders with a no-eject problem and the power LED winks at you when you try to eject the cassette, check the dressing of the wire to the full-erase head. If it goes astray it can get caught between the trigger and detent lever on the side of the cassette housing assembly, thus preventing release of the cradle.

E.T.

Ferguson 3V32/JVC HR7655

This machine operated at about half speed. Double speed wouldn't work and the slow-speed mode was very slow indeed. After a bit of signal tracing with the oscilloscope we found that the fault was within IC6 - the waveforms at pins 3 and 4 were totally incorrect.

K.R.

Ferguson 3V39/JVC HRD110

The problem was intermittent sound muting, recording and E-E depending on the picture content. Dark scenes produced sound muting, bright scenes brought the sound back, while in between the sound fluttered and caused a disturbance to the picture's luminance level. The cause of the fault was traced to L7 on the tuner/i.f. panel. It should be tuned to 15-625kHz but was found to be off frequency. Normal operation was restored when L7 was peaked, using an oscilloscope, but at resonance the core was fully tightened. An un-numbered tuning capacitor within L7's can was thought to be defective. Adding an externally mounted 330pF ceramic capacitor remedied the situation.

K.R.

Panasonic NV-G40

We've had a couple of these machines with the following complaint. After about five seconds the machine switches itself off. When we saw the report on the job card our immediate thought was of a dodgy solenoid. In fact this wasn't the case. When the mechanism solenoid sticks, the machine can't move the mechanism into the correct mode. It thus switches back to standby.

The problem was that when the tape was moving in play, fast forward, rewind etc. it would run for only about seven seconds before the machine went into the stop mode. This sounded like a reel rotation problem, so a check was made at pin 27 of the system control chip IC6001 (t.reel input). When play was selected, this input switched correctly between 0V and 5V a few times before sticking at the high level, even though the take-up reel was still moving. There's an operational amplifier, IC6002, between the system control chip and the take-up reel phototransistor. One of its inputs (pin 3) is held at

2-5V by a potential divider while the other input (pin 2) is connected to the sensor. This latter input varies between about 1V to 3V to give a change of voltage at output pin 1. When play was selected we found that the input switched from high to low but the output remained high, proving that the operational amplifier was faulty. I.B.

Panasonic NV180

This is a 12V machine and was used in a coach. It was brought to us because a cassette was jammed in. To release, you turn the machine upside down and remove the bottom cover at the front. At the front of the machine, near the colour auto switch, there's a release hole through the PCB to a metal plate on the cassette deck. Press this with a screwdriver and the deck will release. See page 2-3 of the service manual.

When we'd done this we discovered that the machine was dead, due to a Wickman fuse (F10J). You'll find it in the middle of the servo board at the back, near TP1003. It's in the 5V line and is not shown in early circuit diagrams, so you can be puzzled if you don't know it's there. J.L.

Ferguson 3V23

This machine played back o.k. but wouldn't record any picture at all, just noise. Someone else had recently fitted a new head. Naturally we assumed that it was o.k. and spent a lot of time making checks and setting up the circuits. When we replaced the head with one obtained from Ferguson normal results were obtained. The head we took out worked all right in a 3V22. J.L.

Ferguson 3V00/16/22 etc.

This VCR got me thinking hard – it had a fault I'd not come across before on one of these venerable machines. When play was pressed, nothing happened. No motors turned, there was no loading and no sensor operation. The play key simply stayed down. All supplies were present and the sensor lamp was not open-circuit. If the after-load switch was operated the drum turned – in fact if the pinch roller was engaged the machine loaded and played. The play microswitch on the front key PCB assembly was open-circuit. S.L.

Schneider SVC245RC

This VCR's tuning was very unstable. It was just possible to tune something in, but the display soon drifted off. There was also some hum on the picture and sound. A scope check on the tuner rails showed that there was some ripple present. The cause turned out to be C3 (47µF, 50V) on the power supply panel. S.L.

Akai VS1

There was not a beep out of this machine. The always 12V and 5V rails were found to be present and a check at pin 9 of the STK5325 chip IC1 revealed that the correct momentary low command came from the microcomputer chip when the power-on switch was operated. This instructs IC1 to switch on provided all is well. A check on its output rails proved that the supplies appeared momentarily then switched off.

Obviously the MB88401 microcomputer chip was detecting a problem. Checks here revealed that the "B

down" signal at pin 5 was permanently low instead of at 5V. As a check the NTSC switching pin 6 was shorted to pin 5. This enabled the power supply, and we were on our way. The fault was traced to TR9 being open-circuit as someone in the past had shorted out the sensor lamp.

A function check on the deck then revealed a further problem. Although the VCR seemed to acknowledge the fast forward command, no motors turned in this mode. All the other functions worked correctly. The switching signal was traced up to the BA6109 reel drive chip IC6 and was found to be normal. There was no output from the chip in the fast forward mode however. I interchanged it with the loading chip as this is of the same type and there was then no tape loading, proving that the chip was faulty. A replacement put matters right. S.L.

Amstrad VCR4600

Nothing at all could be tuned in when using the thumbwheels. As all the tuner supplies were correct a replacement was fitted. This enabled all stations to be tuned in but the station selector buttons didn't change channel. The indicator LEDs changed but the picture remained the same. The AN5015K RAM chip on the front panel proved to be at fault. S.L.

Saisho VRS4000

This machine had unstable drum servo operation. The clue was a momentary sideways movement of the picture every few seconds or so. When the fault was present, selecting pause didn't change the symptom. A variation in drum speed could be heard and seen. When the connector to the lower motor was touched there were wild drum speed and phase gyrations. Since contact couldn't be improved I removed the plug and socket and soldered the wires directly. After a long soak test however the variations continued. The cause of the problem was eventually found to be a hiccup in the output waveform of IC01 (OEC9009). It's interesting that most of the chips in this machine are labelled IC01! S.L.

Ferguson 3V59/3V65/FV11 etc.

A fault that's becoming increasingly common with this range of machines is failure of the STK5481 multiregulator chip. You usually find that the inputs are correct but one of the three outputs is missing. Symptoms include no go with the display coming on but with no on-off LED display, or dead with the cassette being accepted but not coming out. The chips are reasonably priced and are a worthwhile addition to your spares if you see a lot of these machines. N.B.

Panasonic NV370E

This machine isn't a UK model but works on the UK standards. It belonged to a doctor who had brought it back with him from an overseas appointment. His complaint was that since a local contractor had fitted a new aerial the vision had been snowy. On test we found that there was severe hum on the E-E and playback sound and picture and that there was no capstan servo lock. A quick check showed that the unregulated 18V supply reservoir capacitor C1102 was severely leaky. In fact it bulged physically. It's on the mains transformer PCB. N.B.

Servicing Compact Disc Players

Part 11: Servo Systems-2

Joe Cieszynski

Having looked last month at the focus and tracking servo arrangements used in the more common CD players we now move on to consider sled control and the disc rotation servo.

Sled Control

The sled, which is sometimes called the slide or carriage, transports the laser assembly across the disc, either in minute steps or at speed depending on the operation being performed. We saw last month that the two-axis device can move the optical lens through only $70\mu\text{m}$, and that the sled is used to push the entire assembly $70\mu\text{m}$ each time the two-axis device approaches its limit. The circuit that controls the operation of the sled motor is relatively simple. It's really an extension of the tracking servo.

Fig. 11 last month showed the tracking servo circuit used in the Sanyo Model CP-08 CD player. The output from tracking amplifier-2, at pin 27 of the CX20108 chip, drives transistors Q204/5 which in turn drive the tracking coils. See Fig. 1. The tracking drive output is also coupled back to pin 25. The tracking drive waveform (see Fig. 2) has the following characteristics. There's a fundamental frequency of between 200-500Hz, depending on the rotational speed of the disc; an h.f. component that's caused by instantaneous errors introduced during the disc stamping process; and a slow ramp waveform which tracking amplifier-2 generates to move the two-axis device progressively through its $70\mu\text{m}$ travel. This ramp has a duration of two to six seconds, depending on whether the optical assembly is scanning the inner or outer edges of the disc. As the ramp approaches its peak, the tracking movement of the two-axis device will be near its limit. The ramp is therefore monitored so that the sled motor can be energised just before the peak of the ramp is reached. During period A in Fig. 2 the current is increasing and the two-axis device is being moved from its central position towards its $70\mu\text{m}$ extremity. At B the sled motor moves the laser assembly forward and the two-axis device returns to its

central position. Period C is the time during which the sled motor is energised.

The sled motor is thus energised when the waveform at pin 25 of the CX20108 chip reaches a predetermined value. To ensure that the operation of the sled motor is smooth, the higher frequency tracking error signal components must be removed. This is done by the integrator R228/C211. The output from the sled d.c. amplifier appears at pin 23 of the chip. After further amplification by IC202 it's used to switch the sled motor drive transistors Q206/7. During normal play Q206 is used to move the sled forwards (outwards). Q207 is required so that the sled can be returned to the centre of the disc at the end of play or backwards during a reverse track jump. The direction of movement of the sled motor is controlled by switches TM5 and TM6 within the chip: when TM5 is closed the sled moves forwards; when TM6 is closed the movement is backwards.

It's important that the sled returns to the correct position at the end of play so that it's ready to read the table of contents at the next start of play. For this purpose a limit switch is incorporated on the deck. It operates when the sled has returned. The switch may be mechanical or optical and is connected to the main microcomputer chip which in turn tells the servo logic control system in IC201 that the sled has returned and that the sled motor must be de-energised (TM6 opened). This switch can be likened to the unload switch in a VCR. On some early players it's adjustable, the setting being critical. This is one of the first checks to carry out if the player fails to read the table of contents. Fig. 3 shows a switch of this type.

As a check to ensure that the sled has not been jolted out of position while the player was not in use, the sled moves forwards when power-on is pressed, operating the limit switch once. It then moves backwards to reset the limit switch. This routine is also performed each time a new disc is inserted, the action being initiated by the main microcomputer chip.

In many players the sled motor doubles as the loading (disc drawer) motor. This presents no problems from the

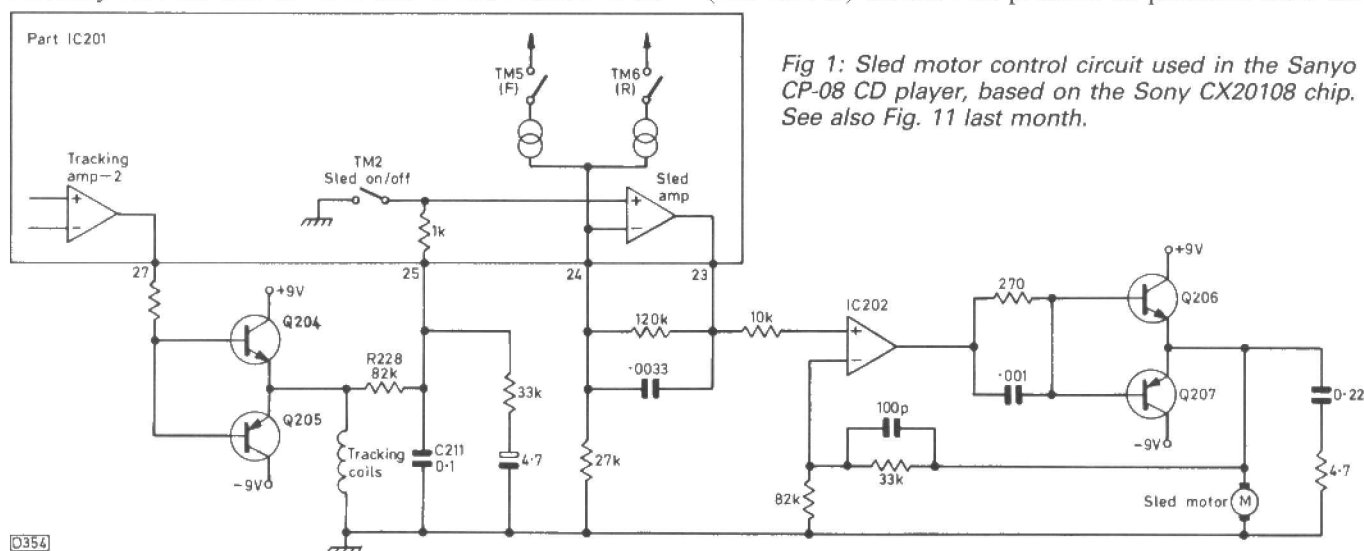


Fig 1: Sled motor control circuit used in the Sanyo CP-08 CD player, based on the Sony CX20108 chip. See also Fig. 11 last month.

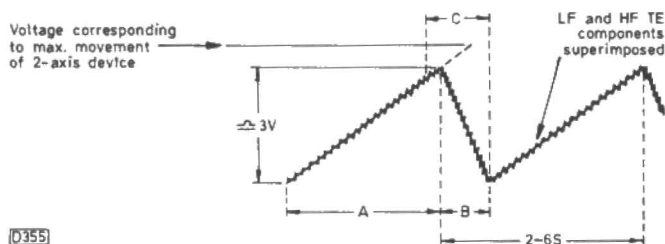


Fig. 2: Waveform at the emitters of Q204/5 in Fig. 1.

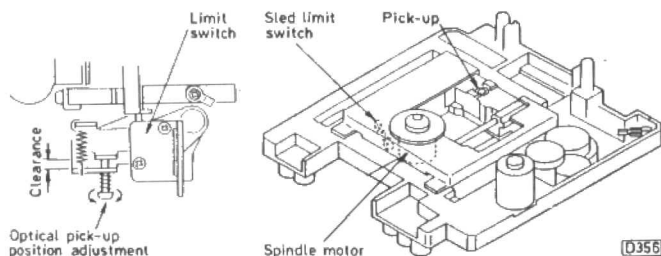


Fig. 3: Example of a limit switch used to set the initial position of the sled. On early models the switch was adjustable: the setting is critical.

point of view of the servo. The main microcomputer chip tells the servo logic control system to open TM2 and close TM5 until the draw is fully closed – closing TM6 opens the drawer. From the mechanical viewpoint this double use of the motor usually calls for a cam to perform the dual functions of sled and drawer control. We'll consider these operations in more detail when we cover deck mechanisms.

Sticking Problems

Generally speaking the sled motor control circuit is not a troublesome section of a CD player. Sticking problems are more likely to be caused by mechanical faults which we'll cover in a future instalment. You may occasionally encounter a player in which the sled remains stuck at one end of its travel and the motor possibly overheats. The most probable cause is a defective drive transistor, e.g. Q206 or Q207 in Fig. 1, a defective operational amplifier, or loss of one of the two supply lines to the sled circuit.

Philips Radial Tracking Arm

The type of mechanism with a two-axis device giving horizontal beam movement in addition to a sled is widely used in CD and other laser players. From an early stage however Philips opted to use a somewhat different arrangement that does away with the need for any horizontal optical unit movement. The principle of the Philips radial tracking arm is illustrated in Fig. 4. The arm is pivoted and is free to swing across the disc, carrying the optical assembly with it. It operates on the same principle as the moving-coil meter, but in this case the tracking servo governs the current in the coils, the servo being controlled by the tracking error signal. In Part 10 last month we saw how the TE signal is obtained with the Philips laser assembly. The direction of current through the coils for forward or reverse tracking is controlled by a transistor circuit that's similar to the one used to control two-axis device coils or a sled.

A simple way in which to compare the Philips radial arm and the double-action sled and coil is to liken the

next month in

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Next month's cover-mounted gift pack contains assorted signal transistors suitable as replacements or for use in projects.

● SERVICING SALORA COLOUR TVs

Ian Bowden and Nick Beer continue the Salora saga with an article covering the K and L chassis. This brings us to Ipsalo-3, a simplified version with just one switching transistor in the primary circuit. In fact the circuitry throughout the chassis is much less complex than in the preceding chassis. With the usual detailed faults list. These sets also appeared under the Hitachi and other guises.

● MORE ON THE ICC5 CHASSIS

This follow-up to an earlier article deals with the colour decoding circuitry and the operation of the power processor chip which controls the two timebases and the chopper power supply. The Thomson/Ferguson ICC5 chassis is one of the most complex chassis currently in production.

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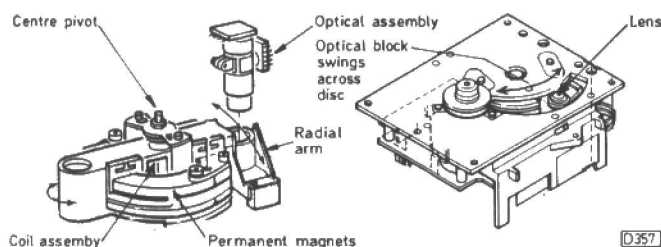


Fig. 4: The Philips radial tracking arm mechanism.

radial arm to a normal record player tone arm that tracks continuously across a disc and the sled and coil action to a linear tracking record player arm that crabs its way across the disc.

From the servicing point of view both systems are reasonably reliable as far as electronic components are concerned. Most problems seem to occur because the tracking servo is out of adjustment, possibly due to the laser ageing or changes in mechanical tolerances. Some early Philips players were prone to dry-joints, but these were fairly random and were not confined to the servo board.

The Disc Servo

The operation of a CD player's disc servo is much the same as with any other type of motor control servo in which a sample of the motor speed is compared with a stable reference source. Because the sample consists of data from the disc, and because this sample cannot be obtained until the disc's speed is approximately correct, a start-up servo is required. As we consider the disc servo part of a CD player we'll look in particular at the Sony second generation chip set in which the disc servo is included in the CX23035 decoder i.c. You'll recall that this chip set was selected to serve as a basic example throughout the series, because it's widely used by CD player manufacturers. Fig. 5 shows in block diagram form the sections of this chip relevant to disc speed control – a block diagram for the complete chip was shown in Part 8 (Fig. 2, page 925, October) where the decoder was dealt with.

The data is recorded on the disc at a constant rate of 4.3218MHz. So for the laser scanning to be kept at a constant linear velocity (CLV) of 1.2m/sec the rotational speed must be greatest at the start of play, when the laser is scanning the inner section of the disc, slowing down as the laser moves towards the outer edge of the disc. The disc's rotational speed is 486 r.p.m. at the start of play, slowing to 196 r.p.m. at the outer edge.

The block labelled "PLL servo" in Fig. 5 runs the disc during normal play. Its sample input is derived from the frame sync signal while the reference is derived from a crystal oscillator. The block labelled "rough servo" takes care of disc run up. It also takes over during normal play whenever the disc's speed is out of the PLL servo's capture range. The block labelled "fast servo" is used during track search and skip (not every model uses this).

We'll consider first the rough servo, which is more often referred to as the speed or run-up servo. The principle is shown in Fig. 6 (this particular example is taken from the earlier Sony Model CDP101). To start things off the servo gives the motor a brief "kick" – this lasts for about 0.3sec. As a result the disc begins to rotate slowly. Once this happens data can be read off the

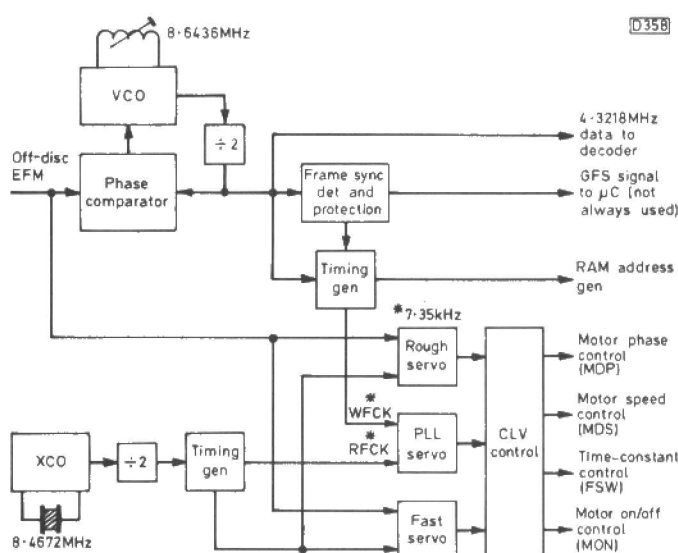


Fig. 5: Block diagram of the disc servo system in the Sony CX23035 decoder/servo chip. Note that the VCO is external to the chip.

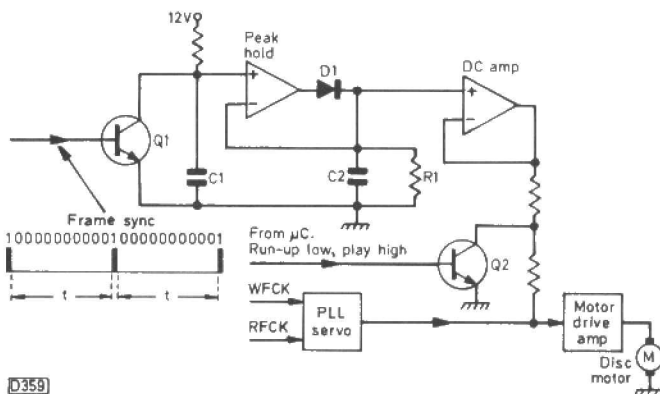


Fig. 6: Operation of the disc run-up servo.

disc, though its rate will be too slow for the decoder to be able to interpret it. The regular frame sync signal with its very distinctive 10000000000100000000010 pattern will be recognisable however (remember that, as pointed out in Parts 6 and 8, the frame period is the only time when ten consecutive zeros occur).

This data is fed to the base of Q1, which is off when a zero is present at its base. Thus when the extended zero period (frame sync) occurs C1 will charge to a peak value. The duration of the sync period (t in Fig. 6) and thus the charge developed by C1 depends on the disc's speed. This peak value is rectified by D1/C2, the resultant d.c. level being used to speed up the disc motor. As its speed increases, the duration of the zero periods in the frame sync signal decreases and the peak charge developed by C1 falls. R1 will discharge C2 to a new lower d.c. level which further increases the motor's speed. The process continues until the frame sync frequency becomes 7.35kHz, at which point the decoder is able to interpret the data. The main microcomputer chip then sends a high signal to Q2's base, switching it on. The output from the run-up circuit is thus shorted out and the disc motor comes under the control of the main PLL servo.

To keep the explanation of this circuit's operation simple, I've shown only the peak hold part, omitting the bottom hold circuit. If reliance was placed on peak hold

only and dropouts occurred during the run up the peak hold would, if the dropouts were longer than the frame sync period t , rise to a value far greater than during the last detected frame sync period. The bottom hold circuit is included to prevent this. It has a much longer time-constant than the peak hold and is used to maintain the last good peak hold sample.

As mentioned earlier, the rough servo also takes over control when the speed of the disc moves out of the range of the PLL servo. This can occur if the player is subjected to shock or if the disc being played has an excessive amount of dirt or grease on its surface, resulting in total loss of the data and sync. Switching between these servos is controlled by monitoring the GFS (guard frame sync) signal produced by the frame sync detection and protection system.

The operation of this system was discussed in Part 8, where we saw that missing sync signals are replaced by an internally generated sync signal which is phase locked to the off-disc sync signal. This is the signal (WFCK – write frame clock, more about this next month) that's

used by the PLL servo as the sample. It can be generated and sustained only when the disc speed is correct and phase locked however. In some players the GFS signal is passed to the main microcomputer chip to provide identification that the run-up is complete and the PLL servo can thus be engaged. When phase lock is achieved the GFS signal is say "high", going "low" when lock is lost. During periods of extensive dropout the GFS signal goes low and after a predetermined time the microcomputer will re-engage the rough servo in an attempt to relock the motor as soon as the data is restored. In the event of the data loss persisting, one of two things will happen depending on player design. In some models the microcomputer will shut down the player. In others the rough servo will keep on initiating the kick-start routine with the result that the disc speed accelerates in definite increments. Eventually, with the disc spinning at a great speed, the microcomputer will initiate shut down and disc braking.

Next month we'll look at the PLL servo in greater detail.

Letters

A DEALER'S VIEW OF SATELLITE TV

Last month's answer to test case 323 led me to reflect on our experience to date with manufacturers' back-up for satellite TV equipment. The supply of systems following the launch of Astra was, as has been well publicised, a shambles. What wasn't so well publicised was the fact that with the systems that did come through at that time there was a very high percentage of missing bits, from LNBs, feedhorns and polarisers to the support rods on the early prime-focus dishes. The problem was getting replacements, spares of any kind in fact. This sort of thing applied, in our experience, with all makes. The situation has improved since then but now that we are getting receiver faults the spares supply situation is very variable. For example Salora/Luxor are superb for receiver spares, but when it comes to dish parts that have to be ordered from sales rather than NCE spares (we've had missing bits and faulty servo motor polarisers) the process is slow. There's no problem with Ferguson dish parts on the other hand, but getting spares for the less reliable receiver can sometimes take weeks.

Very few dealers or engineers had experience of satellite TV reception before Astra, and to date none of the manufacturers we deal with have offered seminars on servicing or installation. Manufacturers such as Salora and Ferguson have compensated for this omission by having excellent technical advice lines. If you've read John Breeds' books you'll appreciate the standard of back-up provided by Salora.

There are now so-called satellite TV experts around every corner. Very few are true experts, and my advice to those looking for help is to go to a company that has been established in this field for several years, with experience of things other than just Astra. The installations carried out by the local branch of a well-known High Street retailer are abysmal, for example joints in the outside downlead just coupled by means of coaxial plugs and taped up after siting the dish in the wrong place, not bothering to route a new lead. Other

organisations however prove that the "big is bad" rule is wrong. I refer to Startrak, a very well organised company. Having been present when some of their installations were carried out I've been very impressed with their work. Never once had an installation to be aborted, all the hardware required is on the van and as the staff have an engineering background TV sets and VCRs are tuned for customers with no problems. The only queries that have arisen have been with B and O equipment, but since some of this is horrendously complicated we don't expect all our own staff to be familiar with it.

Naturally I can comment on only my own experience. Other dealers may have had different experiences. Let's hear yours.

*Nick Beer,
Bideford, N. Devon.*

GRUNDIG CUC2401 SOUND PROBLEM

In the November Service Bureau a no-sound problem with the Grundig CUC2401 chassis was mentioned. The subject is covered in a Grundig Technical Bulletin. You should start fault finding by using your scope to look for the uncontrolled a.f. output at pin 1 of the Euroconnector. If it's not present you are on your own for a bit of conventional fault finding. If a.f. is present here however, and it probably will be, you come to the interesting bit. Try to find another TV set with the same or a later chassis, fitted with the same tuner (part no. 29504.101.01), and fit its tuner in the faulty set. You should then find that you have the sound back. Don't go and order another tuner, as it's probably not faulty but has merely lost its stored data for the analogue sound setting. Look at the microcomputer chip on the control panel. It may be the early Siemens version, type SDA2011-A003, which can be replaced with the later SDA2011-A005 (part no. 8305.158.305). This will ensure that there's no recurrence, but there's a cheaper way out.

Find another set of this or a later series and check whether it's fitted with either the later SDA2011-A005 chip or one of the Motorola ones, type XC89501 or similar. Fit your "faulty" tuner to this set and switch on. It should behave o.k., confirming that the analogue

values have been restored. If all is well, return the tuner to where it belongs in the original set. As a further precaution, fit a BAT41 diode (part no. 8309.198.041) with its cathode to pin 23 of the microcomputer chip and its anode to pin 20 (chassis). I had this fault a couple of years ago. The set has behaved perfectly ever since, after taking the action just described.

I believe that the colour, brightness and contrast may be affected in a similar way, since the tuner's store holds all four analogue values which are circulated around the set on the SDA line.

Les Austin,

Kirk Michael, Isle of Man.

REMOVING SURFACE-MOUNTED ICs

Here's a tip for removing surface-mounted i.c.s., as doing this takes time and can damage the PCB. Take a small screwdriver, place the blade under one corner of the i.c. to be removed, then use a Black and Decker paint-stripper hot-air gun (heat gun) directly on the i.c., taking care not to overheat the PCB. Within two-four seconds the i.c. will come off in one, leaving the board undamaged.

R. Brown,

Bradford, W. Yorks.

BROADCASTING PROSPECTS IN THE UK

While many TV writers went to the Berlin Show to boggle at the latest video offerings I made a trip to Holland to visit an old friend who had been given early retirement by a leading TV manufacturer. Living Dutch for a week in a town away from the tourist run is an excellent way of assessing the local radio/TV situation, and to me at any rate the way things are going in the UK is now much clearer.

Like much of Europe, Holland is extensively cabled. The Dutch have always thought that the country next door has better programmes, and in the past their efforts to pick up stations from across the border have damaged both their bank accounts and their gable ends. Not now. For a reasonable premium, they can get all the programmes they want, clean as a whistle, in system B/G - with 25 f.m. radio channels thrown in. Since the Dutch are delighted with this situation and need little more, VCRs and sets with teletext are very thin on the ground.

Programme selection is by "zapping". Because of their quality, BBC-1 and BBC-2 are very popular. Although the language is no problem to our Dutch friends, they did have a bit of a struggle with "Bread" and old Monty Pythons were watched with the sound down. My friend's network provided 15 channels - Dutch, Belgian and West German as well as BBC, Sky and MTV. Any new channel would have to displace an existing one, so it would have to be good to get in.

Cabling has improved the environment to the extent that there's hardly an aerial to be seen. Those wishing to instal a dish or a Yagi array face hostility from their neighbours. It seldom happens, as most are satisfied with what's on offer via the cable network.

No one knew about MAC, not even my ex-TV friend, and the impression is that the new programmes would be converted to B/G-PAL at the head end, as they did with MAC for the VCRs at the Berlin Show.

So, as the forty wind generators on the new mole at Zeebrugge waved goodbye, what was it that I was so

much clearer about? First that new programmes can succeed only if more attractive than the present offerings, which is a hard target to beat in the UK. Secondly that we are on our own with D-MAC. At Berlin, widescreen and HD TV were demonstrated on D2-MAC, and no way would my friends sacrifice their choice for a wider bandwidth. And finally that deregulation has probably come too late. People are beginning to watch less. Once again we seem to be helping someone to cross the road when they wanted to stay where they were!

Harold Peters, Lowestoft, Suffolk.

MORE ON THE PANASONIC NV730

I would like to add a few notes on the Panasonic NV730 VCR as the following faults are becoming more common. Faults (1)-(3) relate to the timer board, (4) and (5) to the servo board.

(1) Machine will not switch on, no VCR "on" and no functions but the clock is o.k. These systems occur when the MN1512VTJ chip IC7503 fails. This is rather tricky to detect as the power on (L) pulse at pins 46 and 47 is simultaneously in control with the main microcomputer chip IC6001.

(2) Machine completely dead, continuously switches on and off or runs normally then switches off after two-three minutes. The reset 5V line at pin 12 of IC7305 (AN5033) goes missing. This chip also gives faults such as inability to switch between Bands V and VL.

(3) Haywire display, with no functions. This is due to failure of the MN1455BVL chip IC7501 to oscillate correctly. In addition the regulated 12.7V at BP7502, pin 1, is dumped.

(4) Drum running at maximum speed. This occurs when IC2001 fails.

(5) Capstan running at maximum speed. IC2002 fails. Capacitors C2036 and C2037 also fail - no FG pulses.

S. Da Costa,

Nairobi, Kenya.

IMPROVED REGULATION

In order to improve the power supply regulation with the Thorn 1590/1591 chassis I carried out the modification shown in Fig. 1, using a μ A723C variable voltage regulator chip to drive the series regulator transistor VT21, which I changed to type TIP31. The 723 chip was mounted on a Tandy Experimenter's Board which was

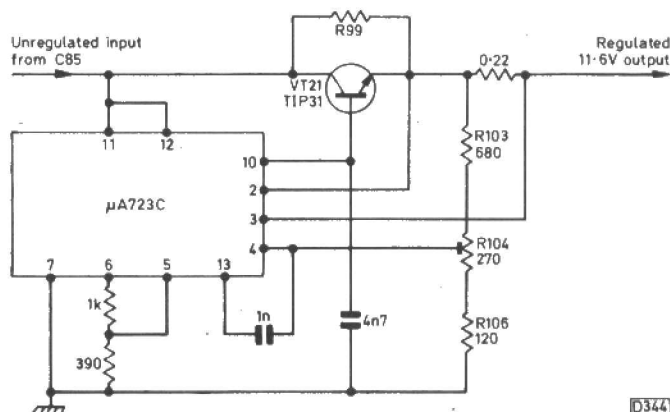


Fig. 1: Modified series regulator circuit for the Thorn 1590/1591 series chassis to provide improved regulation. See letter from K.J. Treeby.

fitted on the metal plate above VT21. The printed circuit was cut to accommodate the 0.22Ω current sensing resistor. Unfortunately, due to the physical layout the potentiometer chain couldn't be connected to the output side of this resistor. The following components were removed: R100, R101, R102, C83, C86, C87, W17 and VT22. R103 was changed to 680Ω, R104 to 270Ω and R106 to 120Ω.

*K.J. Treeby,
Plymouth, Devon.*

STOLEN

Several items were stolen from my car whilst I was staying overnight in Telford on a business trip. These are as follows: An Avo Model 8 in a brown leather carrying case, the probes well worn and repaired with insulating tape; two tool cases, one holding a soldering iron plus a plastic/green cloth tool roll containing various servicing tools, the other case containing tools for the car; and a red plastic spares box of the type with trays that fold out when the lid is opened, containing various electronic spare parts. I would be most grateful for any information leading to the recovery of these items, and would be prepared to offer a reward.

*J. E. Bagley, Whitehall, Bewdley Bank,
Canon Pyon Road, Herts. HR4 7SH.*

CAR RADIO-CASSETTE PLAYERS

I service car radio-cassette players and frequently find that the connections to the tape head have broken. The cause is usually broken cores in the lead, or the lead

breaking away from the terminals on the head. Many manufacturers use very stiff screened cable, often poorly anchored. For many years I've overcome this problem by using record player pickup arm lead – the five-core, very fine flexible cable that's used to connect the cartridge to the sockets under the deck. The lack of screening hasn't caused any problems, in fact many manufacturers have started to use unscreened cable. But it tends to be rather heavy, not very flexible and it still breaks!

The problem is that I have to pay £2.40 for a 15 in. length of the pickup lead, and the source of supply will eventually dry up. I've tried to obtain this type of lead elsewhere, so far without success. Does anyone know of a source of supply, preferably by the metre? Perhaps some enterprising supplier could persuade a cable manufacturer to make some?

*Geoff Davies,
Rugby, Warwickshire.*

WANTED

I would like to thank those readers who have written in with details of playing NTSC tapes on UK VCRs. I'd like to obtain an 8928/JVC HR3330TR, but have so far failed to locate one. Does any dealer or individual have one for sale? If so, please write stating the condition and price (please don't send the machine until a sale has been agreed!).

If any other reader wants one, I'd be happy to keep a "want list" and pass on any offers received.

*John de Rivas, West Towan House,
Porthtowan, Truro, Cornwall TR4 8AX.*

Video Trouble

Les Lawry-Johns

A belt in our Fidelity VCR broke – I'm told it's a Fisher-Sanyo machine. Now I've never repaired a video recorder in my life and don't stock the belts, so I ran down to Geoff's place in Sun Lane. He fitted a new belt and tested the machine. I took it back home and it worked all right for a week or so. Then severe hum bars started to show and you couldn't watch the picture. Back it went to Geoff who kept it for a week or so because it wouldn't record the sound.

Eddy who works for Geoff had replaced some rectifiers to cure the hum bars but didn't seem to want to spend time on the loss of sound recording. Something in the i.f. panel he said. I took it home for Honey Bunch to play with. She was able to use it to play our recorded tapes but wasn't pleased about the sound recording problem and kept on at me to have a go. If Eddy couldn't find the cause of the problem, what hope had I? After some days she visited one of her daughters and came back with an elderly Sony Betamax machine. This frightened the life out of me but, with HB's son-in-law, we managed to get it going and it performs quite well. We have to have a machine so that HB's grandson can watch "Home and Away" and "Neighbours" after we've collected him from school in the afternoon.

I feel guilty about this lack of adventurousness but don't like to risk mucking things up. I still tackle TV sets

of course but the call for repairs is not great nowadays, as you probably know. There are quite a lot of Ferguson portables around with dry-joints causing intermittent field collapse however.

Then there was this chap who brought in a TX10. Said it kept cutting out. He left it and I immediately checked the focus/e.h.t. unit on the right-hand side when viewed from the rear. As it was blackened I disconnected the bottom screws and hung it free as a check – I was down at the shop, and my new focus/e.h.t. units were back at the bungalow, so I had to check as best as I could. The set worked all right, showing a faded BBC-2 picture. Then suddenly there was a flashover in the faulty unit and the h.t. fuse failed. The chopper transistor had shorted, so I had to fit a new BU208A. After doing this I popped back to the bungalow for a focus/e.h.t. unit – the modified type.

When this was fitted the picture was reliable but was faint and lacked green content. I turned up the green at the c.r.t. base but the tube was obviously low. So I took the chassis out, turned it up and shorted out the resistor that's in series with the c.r.t. heaters. The heaters then glowed a bit brighter and the picture slowly improved: after a while the greens returned.

When the owner returned I showed him the picture and told him that it would improve with use. There was a problem with the remote control system, which would give only even-numbered channel selection. I couldn't find anything obviously wrong with the cables and contacts and, as the owner didn't seem to be too concerned about this, I wrapped the set up. Perhaps someone familiar with these sets would like to comment on this symptom?

TV Fault Finding

*Reports from Philip Blundell, Eng. Tech.,
John L. Howard, Ian Bowden, Alfred Damp,
J.S. Ruwala, Mick Dutton and Hugh MacMullen*

Philips KT4 and K40 Chassis

A dead set is a common fault with these chassis. If the power supply is tripping, the BU508A line output transistor is probably short-circuit due to dry-joints on the line output transformer. No output from the line oscillator can be due to a dead TDA3576B chip. If the line oscillator is running but the line driver stage isn't, check whether R3192 (680 Ω) is open-circuit. **P.B.**

Grundig Sat 20

For no sound, just a rushing noise, suspect the S042 chip on the sound module. **P.B.**

Grundig CUC3400 Chassis

This particular set, a T55-340, has been responsible for a few grey hairs recently. It first came into the workshop a few months ago because of intermittent tripping from cold. The line drive signal going into the TDA8140 line processor chip was o.k., but it was distorted at the output. A replacement TDA8140 cured this for a while. When the set came back the fault was fortunately permanent, so I was able to make quicker progress. I found that the power supply was tripping, though it was all right with a dummy load. If the line hold was adjusted so that the frequency was too low the power supply started up and a raster appeared. For the line deflection/switch-mode power supply (it's a variant on the Ipsalo theme) to work correctly the oscillator in the power supply must operate at line frequency. It didn't, at least not quite. The timing capacitor C653 (4.7nF) had changed value. **P.B.**

Grundig Cinema 9050

These projection sets use an early version of the CUC series chassis for the signals etc. and suffer from the usual power supply and i.f./tuner faults. They also seem to be prone to a problem that doesn't appear to affect non-projection sets, i.e. cracks in the main chassis, to the left of the tuner/i.f. can, where the tracks go round a large hole in the PCB. Faults so far have been either intermittent sound or an intermittent blank raster. **P.B.**

B and O 9000 (33XX Series)

Pumping followed by the set going to standby was traced to a dry-joint on the S-correction capacitor C18. An arc could be clearly seen through the PCB. **J.L.H.**

Salora 1G5

Although the grey scale was satisfactory, the faces had a permanent sun tan. This was corrected by adjusting the chroma delay line balancing controls. **J.L.H.**

Ferguson TX100 Chassis

This set would go off after running for a couple of hours, with the 119V h.t. supply switching relay chattering rapidly on and off. If the set was left switched off for a couple of minutes the fault would correct itself and the set would run for some time. With the fault present a

check was made on the 119V and 20V supplies, which are derived from secondary windings on the chopper transformer. They were both at approximately half the correct value, which pointed to a fault in the primary side of the circuit.

A d.c. check showed that the TDA4600-2 chopper control chip's 12V supply was low at about 7V. With the aid of a scope we found that it was actually pulsing on and off at 50Hz. As a result the chopper transistor's output was also pulsing at this rate. This pulsing was due to the start-up circuit (thyristor SCR1 and the associated components) operating. When the set is running normally the TDA4600-2's 12V supply is produced by rectifying the output from winding 7-10 on the chopper transformer. The rectifier was o.k., but the d.c. resistance of the winding measured 50 Ω . After it had been left for a few minutes to cool the resistance had fallen to the correct figure of 0.5 Ω . **I.B.**

Panasonic TX2480 (Alpha 1W Chassis)

The fault report was sound but no picture. When we switched the set on a loud whine came from the power supply and, an important clue, its frequency varied. This suggested that there was no sync feedback from the line output stage which in fact wasn't working. The cause of this was traced to the 1.2 Ω fusible resistor R851 which had risen in value to around 600 Ω . It's in the 26V supply that powers the field output chip and the line driver transistor. Fitting a replacement restored correct working and after a check for shorts the set was put on soak test.

Some two hours later the set failed again. The fusible resistor was o.k. this time but the 26V supply was being loaded down – the voltage reading was around 22V. A check at the collector of the line driver transistor produced a reading of 0V. As its drive was still present we suspected the transistor of intermittently going short-circuit collector-to-emitter. A replacement was fitted but two hours later the set again failed. We were wondering what else could short out the collector of the driver transistor and were looking suspiciously at the driver transformer when the reason was found. There's a long aluminium heatsink that runs across the width of the main panel, between the driver transistor and the driver transformer. This heatsink is earthed by a wire that goes to a screening can. It's fixed in place by some twisted protruding legs that pass through the panel. One of these twists rested against the PCB land that's connected to the driver transistor's collector. The leg was removed with cutters and the set was again soak tested. This time there was no recurrence of the fault. When we looked in a newer set we noticed that the print layout in this area is different, in order to stop this fault happening. **I.B.**

Panasonic TX1786 (Z3-T Chassis)

The picture produced by this set had a brightness gradient. It was correct at the top left corner but was far too dark at the bottom right corner. As a first step we used the scope to check the h.t. line, the tube's first

anode supply and the beam limiting voltage. Nothing was wrong with any of these. The RGB drive waveforms from the TDA3562A colour decoder chip IC601 on the vertical plug-in PCB B had a field-rate ramp superimposed on them however. Now the black level of each output is set by the d.c. voltage established by the clamp capacitors connected to pins 10, 20 and 21. These pins are connected to a common line (TPB14) via three diodes D315/6/7 which are normally reverse biased. TPB14 is connected via an 8.2k Ω resistor and pin 11 of plug/socket B1 to the collector of the UN4112 transistor Q306 on the main PCB. This transistor is used to blank the screen at switch-on – it's then conductive, pulling TPB14 down to about 5.4V. When it switches off, TPB14 should rise to 12V. The problem was that Q306 had a collector-to-emitter leak. Hence its collector voltage was low at 2V and TPB14 was low at 7V. **I.B.**

Salora 1H Chassis

This set was dead apart from a quiet pulsing from the power supply. When the chassis was moved down slightly however the set burst into life. A slight tap on the chassis produced line disturbance on the picture. We tracked down the dry-joint using a small plastic rod. It was at the lower end of CB529 (15nF, 1.2kV), the flyback tuning capacitor connected across the BU500P line output transistor TR500. **I.B.**

Pye 59KE2706 (Philips 2A Chassis)

This set had no tuning though the front display showed the correct channel number. When tuning search was initiated the voltage at the tuner unit's tuning pin remained at a constant 33V. A check on the supplies from the citac board revealed that the 5V supply to the tuner's internal 256 divider circuit was missing. R3740 (5.6 Ω) on the citac module was open-circuit. **A.D.**

Tatung TV9448 (150 series Chassis)

The colour fault with this set was apparent on only some scenes. It produced the impression of Hanover bars. Its true nature could be seen with a colour-bar display: there were alternate bars of colour and no colour. The a.c.c. decoupler C516 (4.7 μ F) was the cause of the trouble. **A.D.**

Ferguson TX90 Chassis

The picture produced by this set had a band that moved up the screen, with picture tearing within this band. Replacing C189 (22 μ F, 50V) in the boost regulator circuit provided a cure. **A.D.**

Sharp C1412H

This set was dead – even the relay didn't click at switch on. The 12V supply from board D was present but there was no voltage at the base of transistor Q753 to switch it on and energise the relay. The base voltage is obtained via D1006 and IC1002. I checked the 5V rail, which was o.k. A miniature switch S1011 behind the colour control was then turned on. The relay gave a nice click but the set was still dead. The full voltage was present at pin 3 of IC701 but there was no output. Resistors R713 (330 Ω) and R704 (47 Ω) were both open-circuit and when these were replaced the set worked normally. To get the sound I had to return S1011 to its original position. Note that

when you pull the chassis out and operate the power switch the standby switch S1009 doesn't operate. **J.S.R.**

Telefunken 615 Chassis

These sets suffer from lots of dry-joints. You'll find them around the chopper transformer TR701 and at the collectors of the chopper transistor T464 and the line output transistor T492. When the fuse has blown almost certainly the chopper transistor (S527T or 2SC1413) will be short-circuit, in which case you'll find that T462 (BC368) and zener diode D538 have also failed. D538 is a 2.1V device and it's important to replace it with the correct value. **J.S.R.**

Alba PTV10

I've come across several of these sets with an open-circuit mains transformer primary winding and am not surprised that Les Lawry-Johns didn't find the invisible fuse (October). Make sure that you replace the bridge rectifier supplied by the maker if you don't want to see the set back in two week's time. **J.S.R.**

B and O 4402

We don't see many B and O sets and it took us a while to sort this one out. The problem was no results, with only 17V on the h.t. rail and the voltages in the control section of the power supply approximately correct. The cause of the fault was 5C10 (47 μ F) which had gone open-circuit. **M.D.**

Ferguson TX9 Chassis

The blue was very poor. A check indicated that the tube was in reasonable condition so as a next step we swapped over the tube base leads. This proved that the fault was on the main panel. The blue clamp capacitor C64 (10nF) associated with the TDA3560 colour decoder chip turned out to be the cause of the fault. **M.D.**

Triumph CTV8205/Amstrad CTV1600

The problem with this set was no field scan. There was no field oscillator output and we found that R709 (22k Ω), which is in series with the field hold control, had gone open-circuit. **M.D.**

Philips K30 Chassis

The picture became progressively greener over a period of two hours. When cold the set worked normally and no amount of shaking etc. would bring about the fault. Eventually, after two visits, I found that the green first anode potentiometer was going open-circuit at its earthy end when heated by adjacent components. This gave rise to a gradual increase in the background green. **H.MacM.**

Philips G11 Chassis

Every now and then one of the 3.15A mains input fuses would blow. The set wasn't suffering from the usual complaints that cause this – the 470 μ F reservoir capacitor, the BU208A line output transistor, etc. We eventually found that R1308, which is in parallel with the mains filter choke L1305, flashed over internally every now and then. It had, on various occasions, led to failure of D3133 in the EW modulator circuit and the BU208A line output transistor. **H.MacM.**

More on VCR Back Tension

Nick Beer

There have been several developments since my article on "The Importance of Back Tension" in the August 1988 issue of *Television*. Despite the fact that incorrect back tension is the root cause of many VCR faults we don't hear much about it from the manufacturers. I shall however continue to emphasise the importance of this adjustment in my articles. In addition many of you will have seen the first results of research carried out by MCES of Manchester on the effects of incorrect back tension, the life of various types of head and the effects of video cleaning cassettes. An article relating to this appeared in the August 1989 issue of *Television* and MCES has published a wall chart that's been distributed to the trade. This article provides an update on the subject and expands on various aspects of it.

New Measuring Cassette

First, Konig has introduced a combined back tension and take-up torque measurement cassette. I've tested the VHS version in the workshop and a colleague has tested it in the field. We feel that it's excellent value for money. It comes in a hard plastic case which is similar to the type used for very early library tapes.

The scales are marked on labels that are stuck over what would, with an ordinary cassette, be the windows. Back tension is measured on the supply reel, from 0-80g/cm (this is of course actually a torque measurement). Take-up torque is measured on the take-up reel, from 50-250g/cm. A marker within the cassette is viewed against these external scales. The construction may seem to be a bit floppy but the accuracy should be within the specified range of ± 2 for back tension and ± 5 for take-up torque. The scales have to be reset to zero manually after each test, by turning the supply spool.

The cassette worked very well on test. The only slight hiccup occurred when it was tested with an old Ferguson 3V00: the VCR's rather crotchety carriage made the spools push up into the cassette and lock off centre, but a quick click returned them to the normal position. This could possibly have been prevented by stronger balance springs within the cassette. Note that back tension (torque) is measured in g/cm, not g as with a Tentelometer.

In view of the cost of the gauges available for measuring back tension most workshops will doubtless have only one type. The very reasonable cost of this Konig cassette gauge makes it a good choice.

Tension/torque Conversion

While most manufacturers quote back tension in g/cm (torque) some, Panasonic in particular, give Tentelometer readings in g. Many people ask about converting these figures. Conversion depends on several factors however. A cassette gauge measures in g/cm the take-up reel torque and the supply reel torque required to overcome the braking force present while a Tentelometer measures in g the force applied between its prongs (effectively the tightness of the tape) at a position between the exit from the cassette and the entry guide

prior to the drum. The only useful conversion therefore is between g/cm and tension (g) at this particular point, measured half way through a three-hour tape.

The problem in practice is that conversion depends on the mechanical arrangement used in a particular deck. For example, Fig. 1 shows the Tentelometer measuring point and a conversion graph for a typical Panasonic deck (actually an NV7000). As you can see, the tension readings are lower than the torque measurements. This is because with this design the back tension depends more on the supply reel braking than the action of the back-tension arm/post. Fig. 2 shows the same conditions for a JVC (Ferguson 3V55) deck. Here the tension readings are considerably higher than the torque ones, because the tension depends more on the back-tension arm. You will see that in comparison with the Panasonic design there's an extra post between the cassette exit and the back-tension post. The ideal situation of course would be for manufacturers to give figures for both types of measurement.

Back to the Konig Cassette

The Konig cassette is an excellent purchase for the workshop. It's about half the price of a Tentelometer or, for example, the Sharp cassette gauge, and in addition you have the take-up torque scale. A separate take-up torque gauge may well set you back another £200 or so, but will of course measure the higher fast-wind torques. The Konig cassette's accuracy with back-tension measurements may at first seem to be a little vague, but it falls well within most specifications. Being a combined unit it makes an ideal tool for field servicing, though care should be taken with handling and storage in these conditions. I suggest that for each engineer in a large company to be equipped with one will be an investment that's soon recouped as a result of quicker fault diagnosis and an improved repair throughput – not to mention the benefits that come with correct back-tension adjustment.

The cassette is available from Willow Vale Electronics at £149.95 trade plus VAT under order code 12-400.

A Philips VHS Deck Design

In the August 1988 article I quoted back tension for various Panasonic machines and showed a typical VHS deck layout. Deck designs vary, as we've seen, but Philips has come up with a mechanism that differs radically from the usual arrangement. It's used in the Philips VR6467 and various clones such as the Pioneer VR707 and the B and O VHS82. Back tension is altered in two ways with this design. First, by what's called "dynamic tape tension", and secondly by supply-reel friction. Both of these should be checked in cases where you'd normally check the back tension.

The tape tension is checked by playing back the Philips test tape and monitoring the phase jump in the white bar at the bottom of the display. It should be 8µsec or less, which equates with one colour bar width. To adjust, move spring 203 along the notches of lever

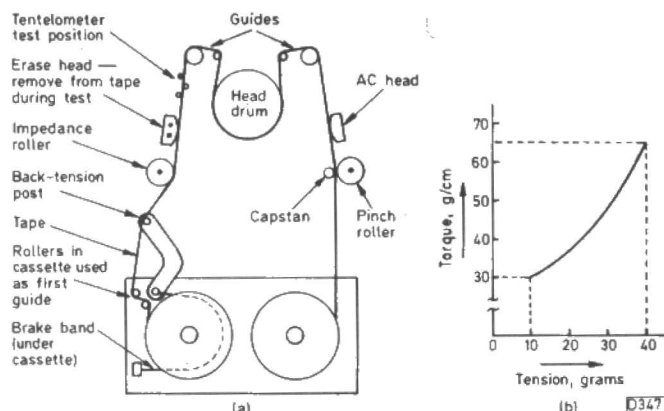


Fig. 1: (a) Typical Panasonic deck mechanism, simplified, showing the back-tension arrangement. (b) Conversion for tension/torque measurements with the D1 deck - 40-45g/cm is the correct back tension (torque).

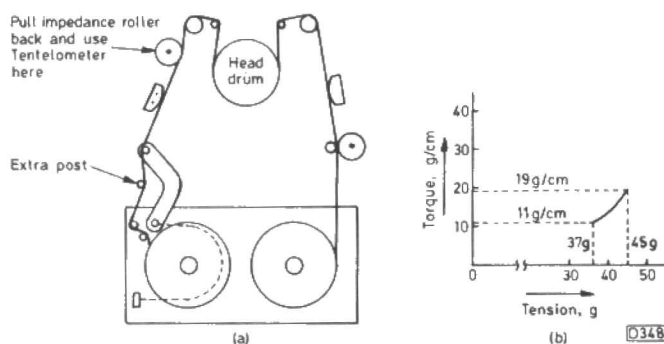


Fig. 2: (a) Typical Ferguson/JVC mechanism. (b) Tension/torque conversion for the 3V55.

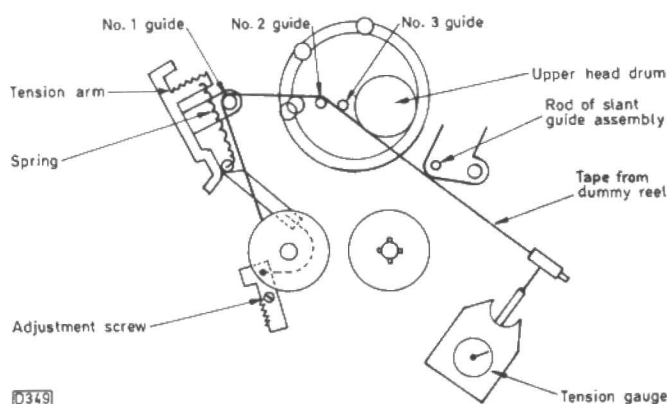


Fig. 3: Video-8 back-tension measurement. You use a fan-type tension gauge and dummy reel.

204. The supply-reel friction is checked by setting the deck in the unthreaded stop position, removing the reel brakes and then, using a hand torque meter, noting the reading in the clockwise direction. It should be 13-16gf/cm (grams force per centimetre). Alternatively use a fan-type tension gauge (see later under Video-8) and a dummy reel. To adjust the friction, set the deck in the threaded stop position, with no cassette in, and alter the position of the spring that's visible through the hole in the mechanism plate, just behind the supply spool - move it to the right to increase the friction.

VHS-C Decks

With VHS-C decks back tension is measured in different ways depending on the deck's make and age. In

the case of older Panasonic machines such as the portable NV200 a Tentelometer reading in grams is specified. With later machines such as the NV-MC10 camcorder a measurement of the landing position of the back-tension post is specified. Tape tension at the traditional measuring point between the erase head and the entry guide is so low that it doesn't register with a Tentelometer. With JVC/Ferguson machines such as the 3C03 a g/cm reading is specified and this has to be measured using a VHS-C torque cassette. JVC produces such a cassette, part number PUJ50431. It's available from Willow Vale Electronics at £239.50 trade plus VAT, order code 20-300T.

Betamax Decks

With most Betamax decks the use of a cassette gauge is specified, the reading being quoted in g/cm or gf/cm. Apparently there's a Beta version of the Konig cassette, and of course Sony have such a unit (torque cassette SL-0003C). Taking as an example the Sony SL-F1, the reading should be 45-48g/cm. In this model a preset, RV202 on board LS-8, is used to adjust the back tension. It's in the capstan servo system which provides electronic torque control. Some Betamax machines use the more traditional variable spring position means of adjustment, as with a VHS deck.

Video-8 Decks

The mechanism used in Video-8 machines is of course very small in comparison with a VHS or Betamax mechanism. As well as the repair problems that this introduces, it also means that a different alignment procedure is required. With Sony machines, to check the back tension you have to remove the mechanism from the machine (camcorder or domestic model), then the cassette carriage from the mechanism. Fig. 3 shows a Video-8 back-tension arrangement. You use a fan-type tension gauge to draw tape through the tape path. The gauge measures up to 30g in either direction, and is used with another reel for take-up torque measurement. The tape is on a dummy reel.

Reel plus tape is part number J-608-083-1A while the gauge is part number J-608-082-4A (Sony part numbers). The gauge costs £77.11 trade plus VAT, the dummy reel with tape £5 trade plus VAT.

You can thus make a practice of checking the back tension with Video-8 decks as well as VHS ones. Here's an example of the benefit of doing this. I recently had to replace a faulty video head in an 18-month old Sony EVA300. I knew that it had had moderate use. The back tension was found to be over 28g instead of the specified 12g.

In Conclusion

I shall probably have to return to this subject again later. Meanwhile if anyone has any further information or queries, please write to me via the magazine.

Addresses

Finally a couple of addresses. MCES is at 15 Lostock Road, Davyhulme, Manchester. Willow Vale Electronics Ltd. can be contacted at 11 Arkwright Road, Reading, Berks RG2 0LU (0734 876 444).

Long-distance Television

Roger Bunney

The striking feature of October's DX-TV conditions was the F2 reception from sources world-wide in Band I. Even Australian TV was seen by several UK DXers. Sporadic E conditions were also active, but the signals received seem almost parochial in comparison with the dramatic F2 catches. First as usual the F2 log:

5/10/89 CST (Czechoslovakia) ch. R2.
7/10/89 CST R1; TSS (USSR) R1, 2; SVT (Sweden) E2; MTV (Hungary) R1, 2; TVP (Poland) R1; RAI (Italy) IA; JRT (Yugoslavia) E3, 4,
8/10/89 DR (Denmark) E3
9/10/89 TVE (Spain) E2, 3.
10/10/89 +PTT (Switzerland) E2.
11/10/89 TVE E3.
13/10/89 TVE E2.
15/10/89 TSS R1; RAI IA, B; Telemarket (Italian private station) E2.
17/10/89 TSS R1; TVR (Rumania) R2; MTV R1; CST R1; TVP R1, 2; DR E3; RAI IA; JRT E3; TVE E4.
16/10/89 TSS R1.
19/10/89 TVE E2.
20/10/89 CST R2; TVE E2, 3, 4; RAI IA.
21/10/89 TVE E2.
22/10/89 TVE E2, 3; RAI IA.
23/10/89 SVT E4.
26/10/89 TVP R1; SVT E2; TVE E2; RTP (Portugal) E3.
29/10/89 RAI IA; TVE E2, 4; TDF (France) L2.

Improved tropospheric conditions were noted across the UK on the 17th, producing Band III/u.h.f. reception from the Benelux countries and West Germany. A less active spell during the 25th produced signals from the same sources mainly in the eastern UK. Interesting catches were RTL (Luxemborg) chs. E36 and 52, SAT-1 ch. E62 and the SSVC UK land forces TV services from West Germany on chs. E23, 41 and 57.

The high level of solar activity resulted in enhanced auroral conditions. Band I/III signals were noted on the 20th, Band I signals on the 21st and lower-level Band I signals on the 22nd. Reception on the 23rd and 24th was largely confined to Scotland, in Band I. There was a similar "northern" event on the 26th.

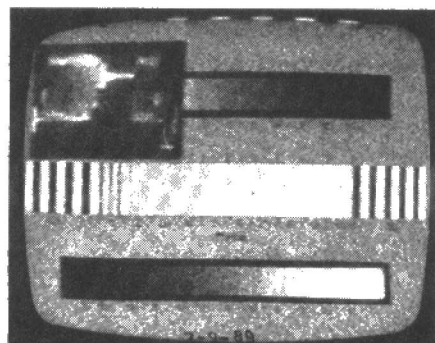
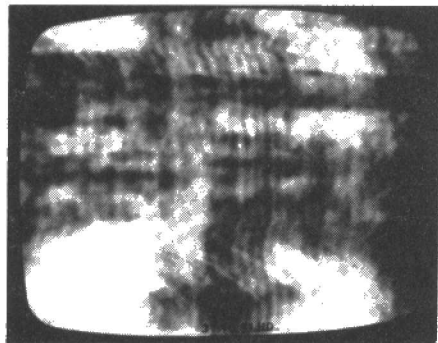
The log so far would represent a fine outcome for

October. The previously mentioned F2 propagation increased the excitement considerably however with signals from very great distances almost daily, reaching up to 55MHz. The collated F2 log is as follows:

5/10/89 Unidentified colour bars from 1000-1035 BST on ch. E2.
8/10/89 Dubai UAE ch. E2 with teletext.
9/10/89 IRIB (Iran) E2.
10/10/89 ZTV (Zimbabwe) E2, with PM5534 test pattern.
11/10/89 RTM (Malaya) E2; ZTV E2.
12/10/89 TSS (USSR) R1; unidentified ch. E2 signal.
13/10/89 TSS R1; RTM E2; UAE E2; IRIB E2.
14/10/89 TSS R1; unidentified ch. R1 and E2 signals.
15/10/89 RTM E2; IRIB E2; UAE E2; football from Africa E2; Australia ch. 0, at 1010-1040 BST, confirmed by Garry Smith as DDQ-10 by measuring the vision carrier offset.
16/10/89 TSS R1; RTM E2; IRIB E2; unidentified ch. R1 signal.
17/10/89 IRIB E2; UAE E2; ZTV E2.
18/10/89 ZTV E2; UAE E2; unidentified African signal on ch. E2.
19/10/89 UAE E2; GBC (Ghana) E2.
20/10/89 UAE E2; ZTV E2 (F2 and TE, see later).
21/10/89 UAE E2; ZTV E2.
25/10/89 ZTV E2; GBC E2; UAE and IRIB E2.
26/10/89 IRIB or UAE E2 (Arabic programme).
27/10/89 UAE and IRIB E2; TSS R1; China C1.
28/10/89 TSS R1; IRIB E2.
29/10/89 UAE and IRIB E2.
30/10/89 TSS R1.
31/10/89 IRIB and UAE E2; unidentified ch. E2 signal at 1200, on programme.
1/11/89 Unidentified ch. E2 programmes; Australia ch. 0 at 0900 GMT onwards, a very strong signal.
3/11/89 TSS R1.

A quite incredible log! Several DXers have commented that TSS R1 has not been as prominent as it usually is at the start of winter F2 reception. At the peaks of past cycles TSS R1 has usually been the first and most reliable F2 signal. Cyril Willis had very interesting ZTV reception on the 20th. It appeared first as normal F2, then appeared at 1855-1925 in the more conventional TE form. This was followed by a short-lived auroral event after which, at 2017 through to 2125, a very late TE opening again produced ZTV.

Iain Menzies, monitoring the 30-50MHz spectrum via radio to check on the rising m.u.f., came across large-scale military exercises by US forces in Egypt, with call signs such as "Cobra Control", "Desert Base" etc., at 50.5MHz. The low v.h.f. band has been full of communications signals, s.w./v.h.f. harmonics, other communications "noises", distant cordless phones, US



Left: An example of "good-quality" F2 reception. Note the multiple images. F2 pictures are generally smeary with reduced h.f. content. Centre: A test pattern transmitted by Hamburg ch. E9 for receiver alignment purposes. Right: Another test pattern transmission from Hamburg ch. E9. All photos are of reception by Ryn Muntjewerff in Holland.

taxi and highway patrol operations etc. I would recommend all those interested to obtain receiving equipment for low v.h.f. signals, such as the Eddystone 770R etc. You can hear weak TV carriers long before they can be displayed on the screen. When I received Australia ch. 0 on November 1st I heard the 46.25MHz carrier long before pictures could be resolved, but listen as I did there was no indication of New Zealand ch.NZ1 at 45.25MHz. The signal levels here at Romsey, Hants on November 1st were truly amazing: very strong, though with appalling picture quality, and suffering from extremes of deep fading.

During the month Garry Smith received System M signals on ch. R1, consisting of a crosshatch pattern and thought to be a USSR transmission error – transmitting what was in effect a vision feed between the USSR and Cuba over a Gorizont circuit.

It seems that sunspot cycle 22 could be leading up to a record high: the average count for September was 176.8, with a peak day of 296!

Enthusiasts elsewhere have of course been enjoying the enhanced F2 conditions. In Perth, Australia, Anthony Mann received European Band I TV signals on chs. E2 and R1 between October 11-16th. He reports that China carries English lessons on the first network. On September 17th Anthony received China ch. C1 (vision carrier 48.27MHz) including the sound over the period 0200-0230 GMT. His log for October confirms, by offset measurement, reception of NRK (Norway) Melhus, Greipstad and Gulen on ch. E2, also either West Germany or Sweden ch. E2 and of course many ch. R1/C1 signals. This emphasises the importance of scanner use, to be able to check on the vision carrier plus offset frequency. The first 50MHz amateur radio contacts between the UK/France and Australia (Alice Springs) took place on October 11th.

A very busy and exciting month then, with the assurance of better things to come. Remember to look on the higher channels when there are signals on the lower ones – and don't forget to look westwards for possible System M, ch. A2 reception from Puerto Rico and North America.

My thanks to the following for sending in reception reports: Tim Anderson (St. Leonards), Garry Smith (Derby), Simon Hamer (Powys), David Glenday (Arbroath), Peter Schubert (Rainham), Paul Barton (Harrogate), Bill Cotterill (Tipton), Iain Menzies (Aberdeen), Mark Baldwin (Northants), Roger Fussell (Torpoint) and Cyril Willis (King's Lynn).

News Items

Belgium: Canal Plus Belgique came on air at 0700 local time on September 27th. Our contact suggests that, judging by the data signal in the last active line of each field, the initialisation point in the Discret scrambling process (pseudo-random sequence) is being changed frequently. The 6µsec sequence also appears at the end of field blanking and is thought to be related to decoder authorisation switching. The PM5544 test pattern is radiated in scrambled form prior to the start of programmes at 0700 local time – at least it was in early October.

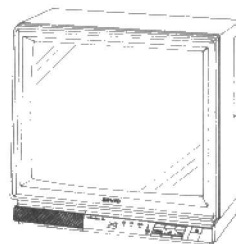
Luxembourg: RTL-V (RTL Veronique) has been seen testing on ch. E24, over Dudelange. Ch. E49 is expected to be used at another site. RTL-V is at present available via Astra 1A.

Greece: Deregulation has been introduced and several independent broadcasters intend to set up operations.

AERIAL TECHNIQUES

SANYO

CEM1747



PAL/SECAM/NTSC

£399.00

Aerial Techniques have secured a select consignment of the renowned **SANYO CEM1747**, a Multi-standard **PAL/SECAM** colour TV covering systems B/G (5.5MHz); System I (6MHz) and System L (French 6.5MHz). It's unique and sensitive tuner features **FULL Bands 1/2/3/4** UHF coverage, including all the elusive cable channels. The receiver will also display **NTSC** (4.43MHz) from an outboard video or tuner/IF system when fed at baseband via the rear 21 pin Scart (Peritel) facility. Screen size is 17" in an attractive monitor style housing and operates on 220/240 volts AC – ideal for the video and TV/DX enthusiast also for regular reception of overseas transmissions and Satellite viewing. It's complete with a 32 channel memory and full infra-red remote control.

Supplies of this quality receiver – intended for the French market – are limited – so act now to avoid disappointment.

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UK mainland Carriage & Insurance is £10.00. All inclusive of VAT.

A few dual standard (System B/G/I) 4 1/2" screen black & white TV's are still available @ £69.95 + £5.50 Carriage & Insurance, all inclusive of VAT.

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Tel: 0202 738232

In brief: Eesti TV (Estonia) has replaced the Tartu transmitter with one at Valgarve. The UEIT test pattern is used with the identification "VJ 1988" ... The e.r.p. of several of the Danish TV-2 network transmitters is to be reduced to avoid co-channel interference problems with transmitters in West Germany and Sweden ... The Italian RAI-UNO and TV-5 satellite TV programmes are being transmitted in certain parts of Poland ... Tunisian second service programmes are now being supplied by the French Antenne-2 service. A third network carrying RAI-UNO programmes is to be established in the near future.

Satellite TV

Several Israeli companies are offering up-market systems for reception from Astra 1A. A dish with a diameter of at least 2.5m is required. A Norwegian ice hockey outside broadcast has been seen on Intelsat 1°W, at approximately 11.5GHz horizontal. The CBS news feed to Sky TV can be seen standards-converted at certain times in the afternoon on its downlink from PanAmSat 45°W to the London Teleport.

I've installed one of the recently reviewed 65cm Salora Astra packages and can confirm the high constructional standard and the excellent reception quality. As a PDS sync processor has been acquired I no longer have the problem of stabilising the EBU news from ECS 7°E – lockable, steady pictures are obtained (the transmissions use sound-in-sync, with consequent vision instability unless steps are taken to counteract this).

Swift Television Publications, 17 Pittsfield, Cricklade,

Swindon, Wilts SN6 6AN has introduced a personalised satellite location printout service. If you send £3 to the address given you'll receive a printout detailing dish angle settings, elevation and azimuth, and modified polar and apex elevation angles for motorised systems, at your location. This enables the dish to be set up accurately to track the whole visible geo-arc. Some thirty satellites are listed, in the 2.5, 4, 11 and 12.5GHz bands. A book list is available free on receipt of a foolscap s.a.e.

A third, updated edition of the "Guide to World-wide Television Test Cards" is available from HS Publications, 7 Epping Close, Mackwoth Estate, Derby DE3 4HR. The price is £4.95 UK, £5.95 continental Europe and £7.25 by airmail world-wide.

Latest EBU Listings

At last there is an official listing of Remada RTT-1 (Tunisia), ch. E4. The location is 10E22 32N19 and the e.r.p. 40kW horizontal.

The following Danish stations are now listed:

Fyne (North)	E22	500kW H TV2	Svendborg	E43	1kW H L
Aarhus	E23	3kW H L	Jyderup	E48	600kW H TV2
Koebenhavn	E23	3kW H L	Odense	E49	3kW H L
Esbjerg	E23	0.5kW V L	Aalborg	E51	3kW V L
Naestved	E23	0.5kW V L	Koebenhavn	E53	600kW H TV2
Fyne (South)	E32	250kW H TV2	Neksoe	E53	1kW V L
Bramming	E33	500kW H TV2	Aarhus	E55	3kW H L
Aalborg	E35	600kW H TV2	Bornholm	E56	800kW H TV2
Vendsyssel	E37	50kW H TV2	Skive	E56	500kW H TV2
Holbaek	E37	0.2kW V L	Vendsyssel	E57	50kW H DR1
Roenne	E39	1kW V L	Koebenhavn	E60	3kW H L
Ringkoebing	E40	600kW H TV2	Fredericia	E60	0.2kW V L
Fejoe	E40	0.2kW V L			

H/V = horizontal/vertical, L = local station.

F2 Reception

A few words on this subject in view of the current interest. With increased sunspot activity there's greater likelihood of low-band v.h.f. signal reflection via the F2 layer, which during the day is at 200-220 miles above the Earth. Since reflection depends on the sun, it follows

that for distant reception to be possible the sun must illuminate part of the signal path. The highest m.u.f. (maximum usable frequency) occurs at solar noon along the path. If, in the UK, an aerial is pointed to the east in good conditions during the early morning period, F2 reflection can provide ch. R1 signals from far into the USSR, a station clock showing a time four-five hours ahead of GMT. Towards midday more southerly signals will be received, e.g. ZTV (Zimbabwe) ch. E2. Towards mid-afternoon ch. A2 signals from N. America may be received.

Multiple-hop propagation is common via the F2 layer, so that signals may be received in the UK from as far away as Australia. Unfortunately with this type of propagation you get multiple images that are smeary and lacking in detail, making identification difficult at times.

The aerial should be mounted as high as possible, for horizontal polarisation. F2 signals often appear out of a noisy screen from nil to quite strong in a relatively short time, as brief as a minute. Openings can last from half an hour to five hours.

Towards dusk the F1 and F2 layers tend to merge and the m.u.f. can rise to say fifty per cent above the daytime level. This is known as transequatorial skip (TE) propagation and will give reception from the south (in the northern hemisphere).

Be sure to send in reports of any exotic reception!

The Late Roy Allen

I first met Roy Allen in 1963, when I was just starting with DX-TV reception. At that time he lived at Christchurch, Hants. He was particularly interested in reception of low-power stations such as Channel and the RTF outlets along the French coast, and in later years his interest spread to local radio stations. Roy subsequently moved to Bristol and became more active with radio. He was a true enthusiast and was one of the pioneers of DX-TV in the UK. Roy fought a brave fight against illness and is now at peace. Farewell, old friend.

VCR Tips

Dave Mackrill

Here are a few tips for those who regularly service VCRs, especially the older types.

Obtain the following: an ink rubber, some pipe cleaners, a hard toothbrush, a sheet of very fine wet-and-dry paper (marked "00 FLOUR") and, from the car accessory shop, a rubber car mat approximately 20 × 27in. for the bench – mine has 5/8in. squares, which hold all the screws, circlips etc. as they are removed from the machine. Don't forget some cheap, odd shapes of chamois leather for tape path cleaning and, of course, isopropyl alcohol from the chemist. The latter is sometimes called Isopropanol, which seems to be cheaper.

How do you remove those very stubborn tape oxide deposits from capstan shafts, and ground-in rubber from capstan motor pulleys, without taking ages, using half a bottle of alcohol, or scratching the surface? Simple. Use a hard ink rubber in the same way that we used to clean car rotor arms and distributor cap electrodes. Then, for

the final deposits and a polish, use a fibre pencil such as the one available from SEME.

I usually remove the clamp to the capstan flywheel and withdraw it, making sure not to loose the oil seal washer that sits between the flywheel and its bottom bush. This gives easier access to both the shaft and the motor pulley. First however I remove the pressure roller and capstan shaft oil seal washer, plus oil pad washer if present, from the top of the deck. It's a good idea to lay an A4 sheet of paper on the bench mat, under the capstan bush, to catch the drops of oil. Then I run a pipe cleaner dipped in alcohol through the bushes, followed by one soaked in oil. This can be kept in a plastic bag, folded and taped to accommodate it, which will contain any excess oil.

The milled friction surfaces of reel tables, motor pulleys and certain Hitachi reel idlers should be scrubbed with the toothbrush after dipping it in alcohol.

If the pressure roller is to be reused, the glaze can be carefully removed using very fine wet-and-dry. Then clean with either soapy water or paraffin then water, followed by thorough drying. Alcohol and methylated spirit are too volatile for use with rubber items – they have a high evaporation rate which can cause cracks in the surface. I still use something called "video fluid", which used to be sold by SEME and is most suitable.

TEST CASE

325

Each month we provide an interesting case of TV/video servicing to exercise your ingenuity. These are not trick questions but are based on actual practical faults.

A camcorder's viewfinder is a tiny monochrome monitor that uses the same building blocks as a conventional TV set or monitor. So the story about to be told is applicable to any TV set – and you wouldn't need specific service data to be able to solve it! Our customer phoned to say that the picture produced by the viewfinder of his Sharp VL-C73 camcorder was blurred. Sliding the lens didn't help, neither did adjustment of the preset focus potentiometer. When the camcorder was brought into the workshop we found that the image on the screen was just a defocused blob. It filled the screen vertically but the horizontal scan fell short. Something was very wrong! Otherwise, the camcorder worked perfectly.

We dug into the viewfinder and found a tiny but perfectly conventional line output stage. It has a sugar-cube sized line output transformer that contains the e.h.t. rectifier. Other supplies derived from the transformer are a 450V boost line that feeds a resistive chain to provide operating voltages for the tube's electrodes, a negative line for the video output stage and to provide grid bias for the c.r.t., and a winding to feed the flea-power c.r.t. heater. Testing started in this area, the first check being on the supply to the line output stage. It was correct at 5V. The 450V boost supply was low at 225V however. Ohmmeter tests showed that the rectifier diode D706 and the resistive chain (total 5M Ω) were o.k., but to be sure we disconnected the diode and checked the input pulse with a scope. The pulses had an amplitude of about 230V, which suggested that the trouble wasn't due to overloading. They were of a strange shape however.

The technician next checked the pulse at the collector of the line output transistor Q704. No pulse amplitude figure is quoted in the service manual, but the fact that the pulses were of 55V peak-to-peak amplitude seemed reasonable in view of the 5V supply to the stage. Again however the pulses had a somewhat peculiar shape – they had slight shoulders. The technician decided to check the duration of the flyback pulses: he adjusted the scope's timebase setting and found that they were of 6 μ sec duration, well short of the expected 11-12 μ sec.

Now a too narrow line flyback pulse usually suggests that there's something wrong with the tuning of the line output stage. The LC circuit consists of the line output transistor's inductive load and the tuning capacitor, in this case C719. After checking the capacitor by substitu-

tion, our man became convinced that the transformer was at fault – with shorted turns maybe, or perhaps something was wrong with an internal diode. Be that as it may, a new one was ordered. It was fitted with care but the result was the same distorted blur as before on the screen. The waveforms and voltages were also pretty well as before. Nought out of ten for diagnostic skill – and great consternation on the part of the owner who, typically, wanted it this Saturday for a wedding.

Back into the little beastie with the scope then, this time to check the line drive waveform. It was good and square at the line driver transistor, and the coupling capacitor was o.k. The electrolytic capacitor that provides coupling to the line scan coils was also all right. A substitute efficiency diode and line output transistor did nought to help matters.

A while later the technician was kicking himself. If only he'd looked more closely at his scope! – or brought in another test instrument. So what was the cause of the trouble? See next month for the answer.

ANSWER TO TEST CASE 324 – page 136 last month –

No, a new luminance drive chip didn't cure the problem with the Hitachi VT33 VCR. You'll remember that it wouldn't record a picture, though the E-E picture was fine.

Really, there should have been no great surprise: there was a fundamental flaw in John's reasoning as he attempted to diagnose the cause of the trouble. The value of the coupling capacitor C248 at pin 28 of the chip is 0.022 μ F. At the vision carrier frequency (4MHz) its reactance would be about 2 Ω . To drop a 4MHz signal across 2 Ω you'd need very high power from a driver stage with a very low output impedance – and that's no description of Q201 and its associated components! Plainly C248 had gone open-circuit, leaving the luminance-plus-chrominance signal at the collector of Q201 to "walk the plank". Shunting another capacitor across C248 restored normal writing current and good recordings were then made. The original capacitor measured but a few puffs on Television Ted's 1954 capacitance bridge.

The inevitable customer relations problem followed the technical one. It was left to Sage to sort out – "it's his bloody job", as John rightly said. The estimate had been made on the basis of replacing the reel idler, but the prolonged sortie into the luminance recording department had more than doubled the bill even without the cost of the chip being charged. Not to worry said the customer. He never used the machine for recording – there was no aerial point in his bedroom where he used it for playback only . . .

QUERY SERVICE CLOSED

See note on page 189.

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